THE JOURNAL OF THE AMERICAN OSTEOPATHIC ASSOCIATION

Vol. 43, No. 5 | 540 N. Michigan Ave., Chicago 11, Ill. | January, 1944

War Service Conferences Coming Soon

PHYSICIANS are under obligation as never before, to themselves and to the public, to assemble and familiarize themselves with advances in prevention, diagnosis, and treatment of disease and injury. Doctors' meetings are in the highest degree in the public interest. Their purpose is different from the annual get-togethers and social conventions of many groups having problems which concern only themselves and which could be settled just as well by mail.

Rationing of tires and gasoline has curtailed or eliminated some meetings of small groups where the automobile furnished the chief or only means of transportation. This makes it all the more imperative that there be full attendance at gatherings where for two or three days intensive refresher courses are provided, such as at state and regional osteopathic gatherings which will be frequent within the next few weeks, and especially at the War Service Conference at Chicago, running five full days, July 14-18 inclusive, when the best available information applicable to present conditions is made available.

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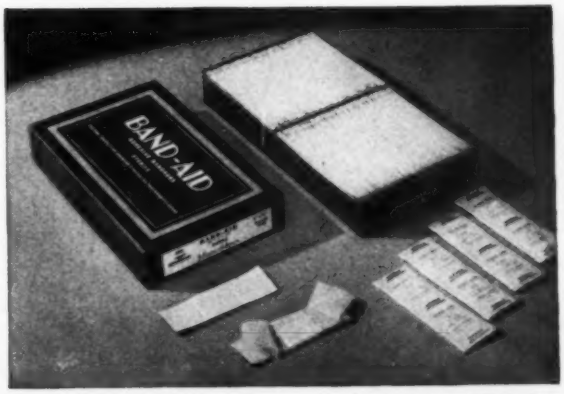

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Published monthly by the American Osteopathic Association. Office of Publication, 100 S. Kenilworth Ave., Oak Park, Ill. Address all communications to the Main Office at 540 North Michigan Ave., Chicago 11, Ill. Subscription $10 a year. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized August 31, 1922. Entered at the Oak Park, Ill., post office as second class matter, April 1, 1926, under the Act of March 3, 1879.

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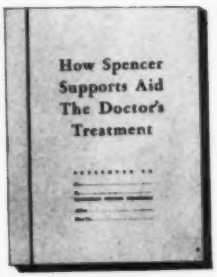

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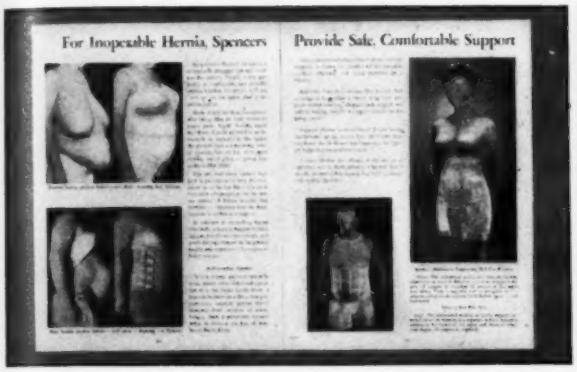

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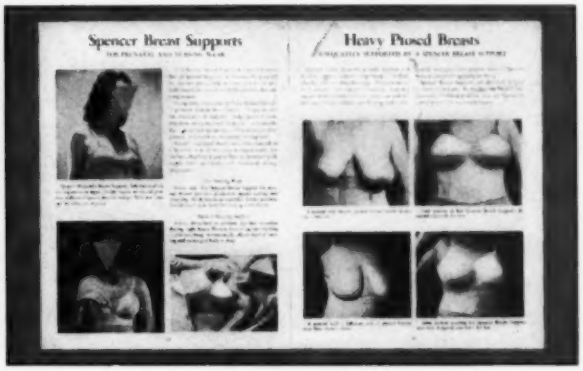

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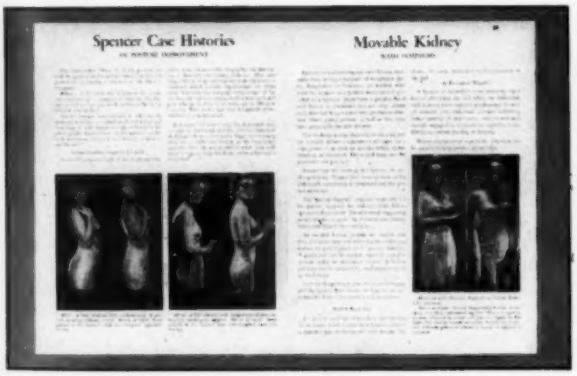

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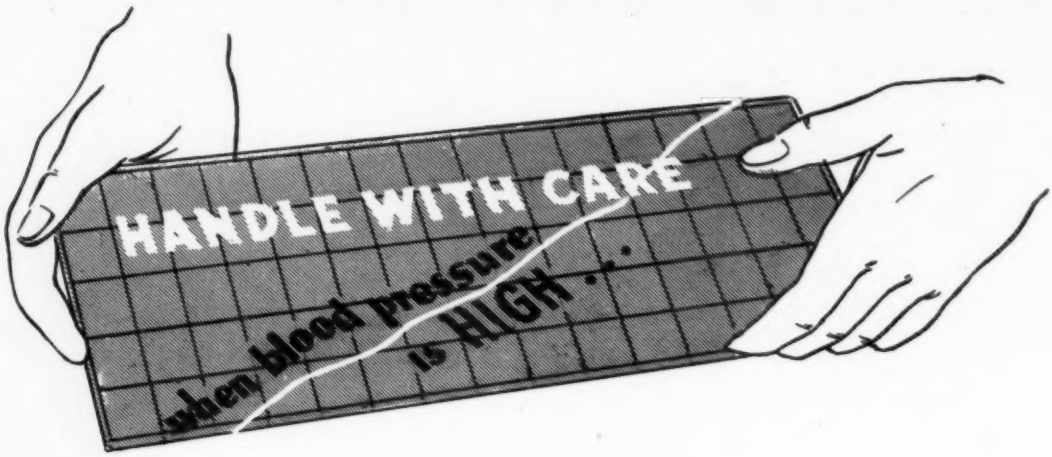

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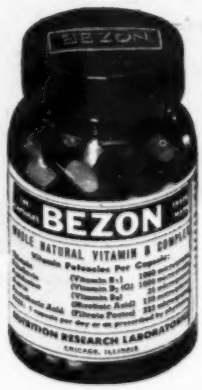

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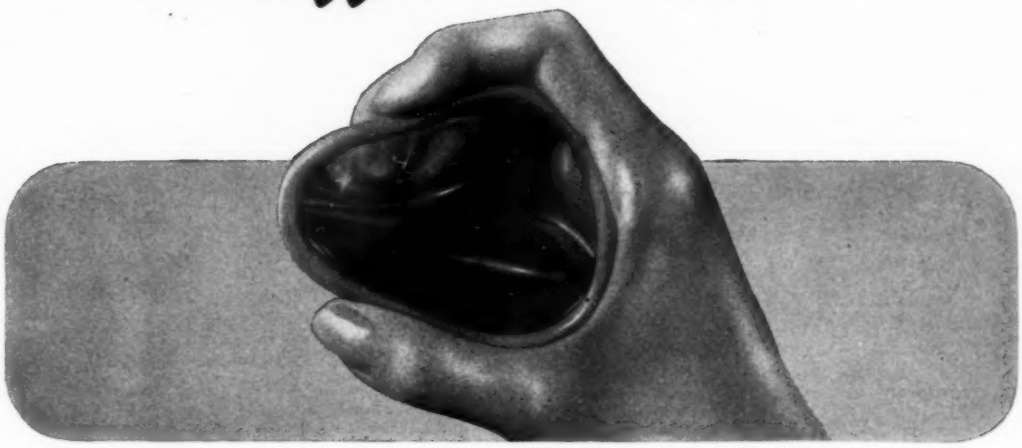

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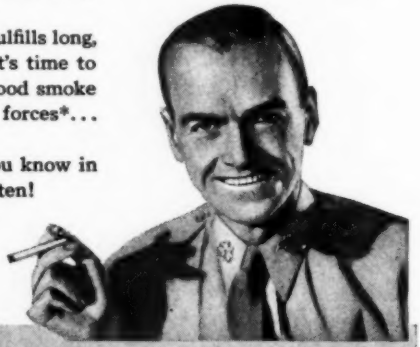

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The Journal of the American Osteopathic Association

PUBLISHED MONTHLY BY THE AMERICAN OSTEOPATHIC ASSOCIATION

Vol. 43, No. 5 | 540 N. Michigan Ave., Chicago 11, Ill. | January, 1944

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Osteopathy and the Intervertebral Disc*

ALLAN A. EGGLESTON, D.O.

Montreal

Injuries of the intervertebral disc have interested the clinician for less than fifty years. The first known report of rupture of the disc was made by Kocher in 1896. His patient had died of internal injuries following a severe fall, and on post-mortem examination the disc between the first and second lumbar vertebrae was found to be ruptured with protrusion into the spinal canal. It was not until 1911, however, that the possibility of backache resulting from such protrusion was considered. Goldthwait[1] described the syndrome and later several other M.D. orthopedists did also. The majority of these men considered the condition to be a tumor or growth on the disc. Dandy[2] reported two cases in 1929 in which he recognized the true nature of the condition as a protrusion of the disc itself into the spinal canal.

There has been a sharply increased interest in the disc since that time. Today it occupies a large place in the literature of orthopedic procedures in low-back pain and in pain segmentally related to the lower lumbar region. Technics have been devised, revised, discarded and accepted for the diagnosis and treatment of herniation of the protruded disc. This paper is intended as a discussion of a conservative osteopathic approach to disc disturbances. It is more the expression of an opinion than a report of new procedures or miraculous cures.

A review of the anatomy and physiology is essential as a basis for discussion of disc disturbances in the lumbar region of the spine. This review will be brief as we are all familiar with the formation of the annulus fibrosus, the nucleus pulposus, and the cartilaginous plates. It will suffice to point out that the annulus is much stronger anteriorly than posteriorly, that it is not intended as a weight-bearing structure and that, posteriorly, it receives support from the longitudinal ligament in the mid-line only.

The nucleus pulposus is of soft semifluid consistency and is thought by most anatomists to be the remnants of the notochord. Halladay[3] calls attention to the fact that it has developed into a specialized tissue fitted for the extremely important work that it does. The mechanical functions of the disc are multiple. It affords shock-absorbing support to the spine; it acts as a ball bearing in the production of spinal movement; and it maintains proper intervertebral spacing to permit the functioning of the articular processes. The cartilaginous plates lie between the nucleus pulposus and the adjacent vertebral bodies, thickest in the center and thinning out at the periphery, where they bend with the annulus fibrosus.

Osteopathic physicians have learned to look upon all body ailments in their relationships with the whole. It is impossible to isolate one region and understand its mechanics and their perversions. It is essential to correlate any region with the rest of the body. Before we localize our discussion to the lumbar spine, let us orient the problem with total body mechanics. The lumbar portion of the spine occupies the last five presacral segments in the normal individual. It is supported by the sacrum and rest of pelvis, and lower extremities from below, and in turn supports the thoracic trunk, the head and upper extremities. Interference in the normal mechanics of the lower extremities or pervis or both disturbs the support of the lumbar vertebrae; and in the same manner, disturbances in the weight distribution or function of the trunk or upper extremities affect their balance.

The relationship of the inferior arthrodial processes should be noted. They lie posterior and medial to the superior arthrodial processes of the adjacent vertebra. They are maintained in normal relations by the vertebral separation afforded through the dics.

Ligamentous support is afforded to the lumbar vertebrae by the intertransverse ligaments, strong bands of fibers running between the consecutive transverse processes; the articular capsules, typical capsular ligaments which enclose the apophyseal joints; and the supraspinal ligament, which runs the length of the spinal column. This ligament reinforces the intraspinal ligaments which lie deep within the spaces between the spinous processes. Further support of the lumbar vertebrae is furnished by the quadratus lumborum fascia, whose fibers run from the lower ribs to the crest of the ilium. En masse, these tissues lend considerable stability to an otherwise unstable structure. The heavy iliolumbar ligaments, arising from the crests of the ilii and inserting in the trans-

*Delivered before the annual Refresher Course of the Ohio Association of Osteopathic Physicians and Surgeons, Columbus, October 15, 1943.

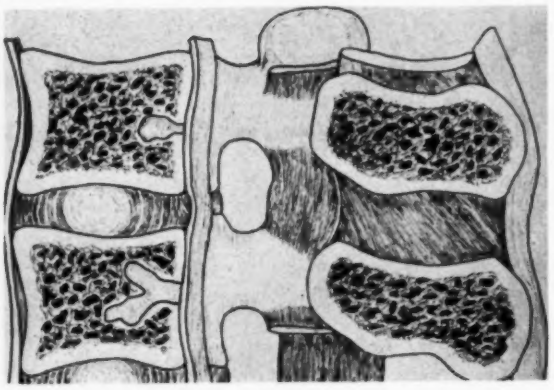

Fig. 1.—Median sagittal section of two lumbar vertebrae and their ligaments. (Drawn from illustration in "Anatomy of the Human Body" by Henry Gray. Ed. 21. Lea & Febiger, Philadelphia, fig. 308, p. 288.)

verse processes of the fifth lumbar, further stabilize that segment so that the major part of lumbar movement takes place in the segments above the fifth.

On the anterior aspect of the lumbar spine we see the intervertebral discs which adhere tightly to the vertebral bodies and, in themselves, limit the range by hyperextension. Their thickness and the incompressibility of the nucleus causes flexion to take place through the arthrodia rather than through an approximation of the vertebral bodies. The anterior longitudinal ligament runs the length of the column and blends with the fibers of the annulus fibrosus. This is a strong ligament that rarely sustains injury through the ordinary forms of trauma that affect the lumbar vertebrae.

The sagittal section more clearly shows the relations of the anterior and posterior longitudinal ligaments, the ligamentum flavum, and the interspinal ligaments (Fig. 1.).

No blood supply to the disc has been demonstrated, but it is believed that they receive their nutrition by way of lymph circulation from the adjacent vertebral bodies which are highly vascular. Until recently, the nerve supply to the discs had not been known, but Roofe[4] has shown that the annulus fibrosus is supplied by a recurrent branch which leaves the spinal canal distal to the ganglion and re-enters the canal to supply the disc two segments below (Fig. 2). This innervation carries heavy implications to the osteopathic physician. It accounts for the unexplained effect of lesions that are not directly related to the segment in which the symptoms are manifest.

It must be remembered that ligamentous support means the support afforded a joint at its extreme limits of motion. In order to permit a free range of movement in a joint, the ligaments supporting that joint must allow, not only the amount of movement normally employed by the joint, but also the factor of safety motion described by Brown.[5] The first line of support of any joint is the musculature that moves that joint. In the lumbar portion of the spine, these muscles consist principally of the flexors and extensors of the trunk. The flexors—the anterior abdominal muscles, the hip flexors and the psoas—are antagonists of the extensors—the sacrospinalis and erector spinae mass, the gluteus maximus and the hamstrings (Fig. 3). When the body is in the erect position, the psoas becomes an extensor because its attachment is to the transverse processes and the posterior portion of the vertebral bodies. Therefore, in full extension, the origin lies posterior to the axis of motion and contraction of the psoas tends to aid the contraction of the sacrospinalis.

This brief review of the anatomy of the low-back region will serve to emphasize the fact that a complex mechanical structure is involved in all pain related to the lumbosacral portion of the spine. The picture is made even more complex by the atypical development frequently found in this region. It must be borne in mind that these structures lie deep to the palpating fingers, and that many of the atypical developments can be determined only by visualization through the medium of x-ray.

The diagnosis of low-back conditions is frequently considered an easy matter. The success of osteopathic therapy in the great majority of painful conditions arising from or related to the lumbosacral region is apt to make the osteopathic physician a little presumptuous in the management of these cases. All too frequently the diagnosis is made by the time the patient has walked into the treating room; it is confirmed by the presence of spinal lesions with segmentally related telalgia, and therapy is begun with the firm belief in the physician's mind that he is dealing with another sacroiliac or lumbosacral condition.

Unfortunately, these cases do not all show the expected response. Every osteopathic physician has had the painful experience of losing the odd low-back case that failed to respond to his approach. While our average is exceptionally good, there is no excuse for losing that odd case where an incorrect prognosis has been based upon an improper diagnosis. Some of these patients will have to go to surgery, but they should go to surgery under our direction, not in spite

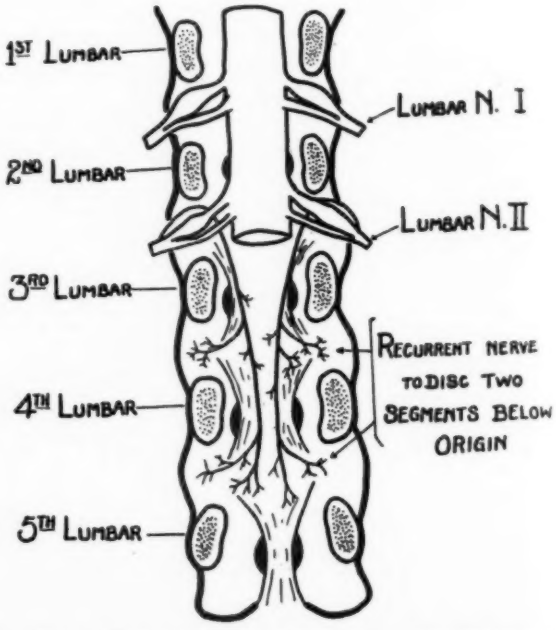

Fig. 2.—Showing distribution of the second recurrent lumbar nerve to supply the disc two segments below. (Drawn from illustration in article by R. Glen Spurling and F. Keith Bradford, Jour. Am. Med. Assn., 1939 (Dec. 2) 113:2020.)

Fig. 3.—Illustrating antagonistic muscles controlling movement in the lumbar portion of the spine. (Drawn from illustration in article by Paul C. Williams, Jour. Bone and Joint Surg., 1937 (July) 19:693.)

of our efforts. Every patient presenting symptoms that arise from the low-back region should be thoroughly examined, and the diagnosis should be arrived at after a proper evaluation of all findings. The tendency to assume a diagnosis of mechanical disturbance, that has resulted from our success with so many of these conditions, must be avoided. It is this hasty diagnosis, based on blind faith in the efficacy of manipulative therapy, that leads to criticism for failure to recognize the occasional surgical case.

Destruction of the intervertebral disc probably occurs more often than our clinical results would indicate. It is undoubtedly true that we have treated many cases in which there was some disturbance of one or more intervertebral discs where the condition has escaped our notice. In those cases where disc destruction did not bring about an actual nerve pressure, where symptoms were produced by altered mechanics, manipulative treatment has been able to effect a marked improvement in the mechanics.

Disc destruction does not produce nerve root pressure in all cases. The nuclear material, being incompressible, must extravasate in rupture of the disc; but the extravasation may take place outside of the spinal canal, or it may take place within the canal without impinging upon a nerve root. The classical Schmorl's node is an excellent example of disc rupture outside the spinal canal. In this condition, the nuclear material ruptures through the cartilaginous plate into the body of the adjacent vertebra. This condition cannot be shown by x-ray until sufficient time has elapsed to permit the body to form a calcified wall around the extruded material (Fig. 4). No nerve pressure would

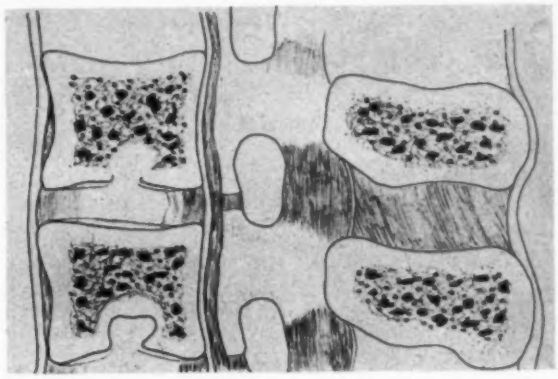

Fig. 4.—Sagittal section illustrating herniation of disc into the body of a vertebra.

result from this type of lesion. The mechanics of the involved area would be greatly disturbed as the result of the decrease in the intervertebral spacing, the increased apposition of the articular surfaces, and the alteration in the character of motion at the facets.

It might be pointed out at this time that the surgical removal of the extravasated material does nothing to improve the mechanics of the destroyed disc.

When herniation takes place into the spinal canal, the expressed material forms a small tumefaction on the anterior wall of the canal which may cause pressure upon the cord or upon a nerve root, according to its location (Fig. 5). The posterior longitudinal ligament blends with and strengthens the annulus at the mid-line (Fig. 6). The weaker areas lie lateral to this ligament, and encroach upon the intervertebral foramen. Disc protrusion in the cervical and thoracic regions might exert pressure upon the cord but, as the cord normally ends at the level of the first or second lumbar, this danger does not exist in the lumbar portion of the spine (Fig. 7). The dural sheaths of the nerve roots are adherent to the bodies of the vertebrae above their exit. Rupture of the disc occurring at the site of the adherent root covering could create pressure and friction upon the nerve radicle.

Some time ago, I had the good fortune to hear a lecture by Dr. E. B. Krumbhaar, the pathologist of

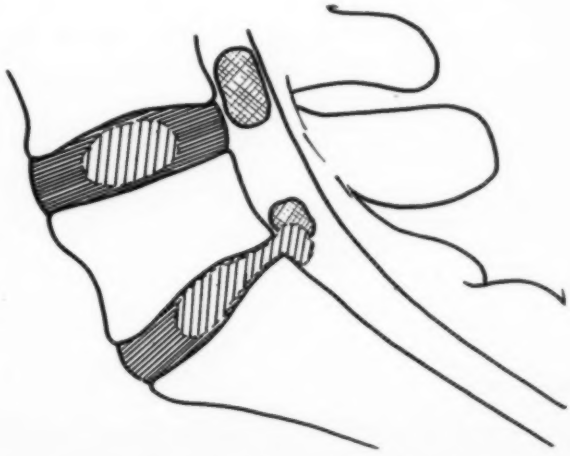

Fig. 5.—Illustrating herniation of disc into the spinal canal.

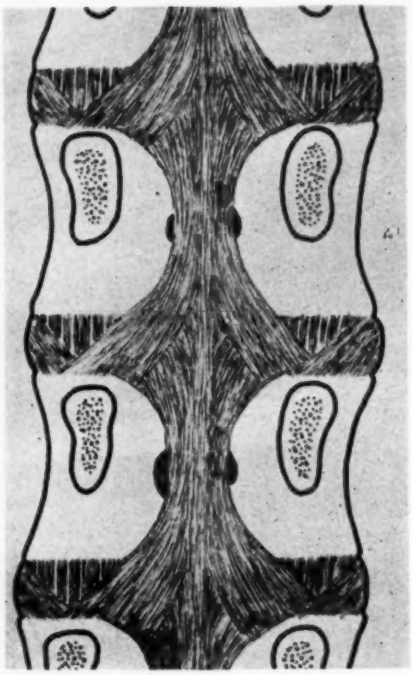

Fig. 6.—Illustrating how the posterior longitudinal ligament blends with and strengthens the annulus at the mid-line.

the University of Pennsylvania, when he used a term which I think is particularly apt. He spoke of the *constellation of disease,* pointing out that disease conditions are not the result of any single factor, but, rather, the culminative result of many co-existing factors. I believe that picture can be applied to the production of disc disturbances. Many factors may contribute to the production of a ruptured disc, and important among them is trauma.

It is possible for a single severe injury to produce a rupture of a disc, but it has been my experience to find a negative history of severe injury in the majority of cases presenting disc conditions. The more common history is of repeated slight trauma that has been localized to one region.

Louisa Burns[6] has demonstrated the probable cause of this localization of trauma in several ways. She suggests the probability that edematous discs may be present in all cases of spinal curvature and in all variable and recurrent lesions. The edematous disc leads to hypermobility, wider separation of the related vertebrae, elimination of the safety factor in motion, and increased liability to strain. Edema of the disc is the result of increased acidity of the soft tissues involved in the lesion.

The colloidal nature of tissues causes them to take on fluids when in a state of increased acidity, and to give off fluids in increased alkalinity. It has been conclusively proved that the acute lesion, through its disturbance to the vasomotor system, causes a retention of the waste products of metabolism and hence a decrease in the hydrogen-ion concentration. It has also been shown that the area of a chronic lesion loses its relative acidity and the involved tissues undergo changes of desiccation. These changes are found in the discs in association with acute and chronic lesions.

In the chronic lesion of long standing, the disc becomes thinner and sclerosed. Restricted motion is encountered on palpation, the bodies of the related vertebrae are more closely approximated and the inferior arthrodial processes of the superior vertebra are forced down in relation to the superior arthrodial processes of the lower vertebra. Either of these conditions, localized increased or decreased hydrogen-ion concentration, would alter the function of the lumbar portion of the spine in such a way as to promote a localization of stress and result in injury.

In a recent article Haboush[7] reports on experiments to determine the nature of traumatic injuries to the lumbar vertebrae. The spines of cadavera in this region were subjected to hyperflexion through the use of a turnbuckle device. Flexion was carried to the point necessary to bring about destruction of tissues, and the sequence of events was noted. When the limit of flexion was reached the strong supraspinal ligament acted as a check and rotation was produced. The greatest strain was then thrown on the quadratus lumborum fascia, the iliolumbar and intertransverse ligaments on the side of the convexity. Forced flexion was continued, and a tear developed in the quadratus fascia and the intertransverse ligaments on the convexity at the level between the fourth and fifth lumbar vertebrae. Further force extended the tear to the articular capsule and the annulus fibrosus. The supraspinal ligament was the last tissue to rupture.

The specimens used in this experiment were stripped down to the ligamentous and osseous structures. The musculature and associated fascias were

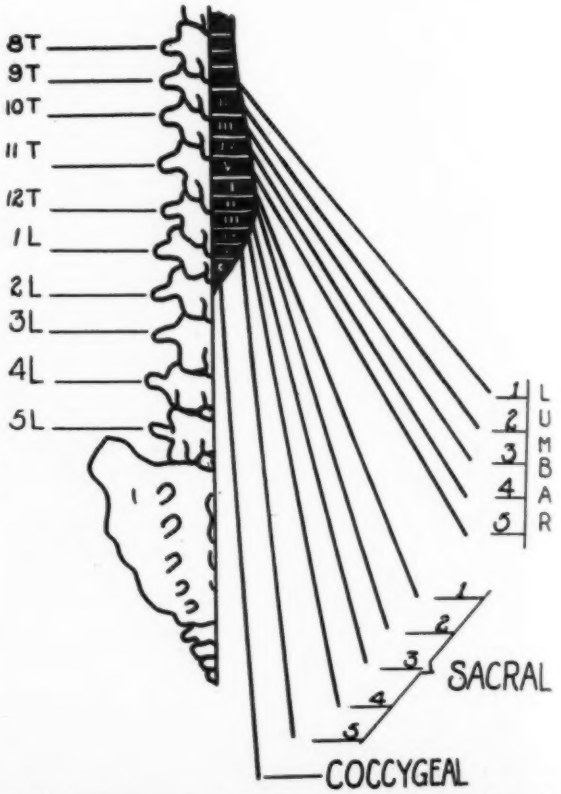

Fig. 7.—Diagrammatic of the lower section of the cord which ends normally at the level of the first or second lumbar vertebra.

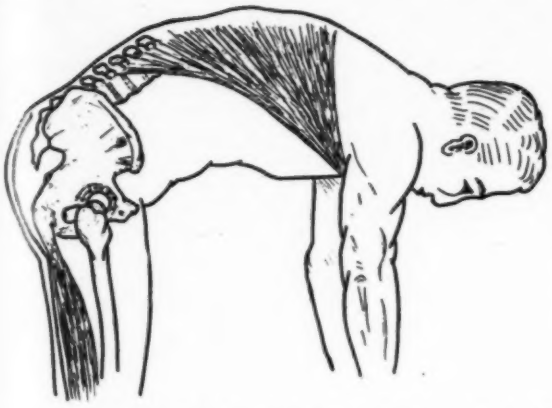

Fig. 8.—Illustrating the forward-bending position assumed to pick up something. In the straightening up process which follows injury of tissues in the low-back region may occur.

removed. The force applied was extreme, through the leverage of a turnbuckle that approximated the first lumbar to the symphysis. Similar forced flexion might possibly result from motor accidents or severe falls, or in the handling of unconscious individuals, but it is hard to imagine such an injury being self-induced. The protective reflex that is stimulated at muscle tension, and the splintage action that would result, would aid in the prevention of such trauma.

One form of traumatization is so common that it merits consideration here: the "stoop and stuck" incident. An apparently healthy individual bends down and is unable to straighten up again. It is obvious that this condition is produced by a constellation of circumstances. Fatigue, toxicity, repeated minor strains, unfavorable environmental conditions, improper use, etc., all contribute to the picture. However, it should be interesting to analyze the mechanics of the movement that climaxes this constellation. This man has assumed a forward-bending position with no difficulty (Fig. 8). He has taken hold of something which may be heavy or light (frequently it is something as insignificant as an empty milk bottle), that occupies his hands and arms with some degree of effort. In this position the lumbar spine is flexed, the bodies have approximated at their anterior margins and opened at their posterior margins, the arthrodia have separated to the limit of their normal range of movement and the supporting ligaments are extended to their limit of safety.

As the individual attempts to straighten up, the muscles of the arms and shoulders are occupied with whatever is in the hands. The fixing effect of these muscles extends as low as the origin of the latissimus dorsi and the trapezius. The hamstrings and sacrospinalis contract in an effort to extend the pelvis on the thighs and the trunk on the pelvis. Thus a tug-of-war is created which centers in the lumbar region. When this localized stress falls upon tissues that are already impaired by some other factor (previous trauma, toxicity, spinal lesion involvement, etc.), the constellation of adverse circumstances is complete.

Diagnosis of disc rupture with nerve pressure is made by the subjective symptoms, x-ray examination, and special x-ray technic. An attempt has been made to arrive at a diagnosis by analysis of the spinal fluid, but the more recent consensus is that the test of total nitrogen in the spinal fluid is unreliable, and that increased intraspinal pressure is not pathognomonic of the condition.

The subjective symptoms that are suggestive of disc disturbances are recurrent or persistent low-back pain that has existed for some time. This pain is frequently associated with sciatic neuritis of one side, but the low-back symptoms usually precede the sciatic radiation. The pain usually becomes exaggerated upon activity, although these patients find more comfort standing than sitting. There may be hyperesthesia or paresthesia in the extremity, but this sign has not proved reliable. The reflexes are usually normal. Deep palpation or percussion on the spinous process of the involved vertebra will produce sensory changes in the sciatic nerve in many cases, and sneezing will often initiate a stab of pain down the leg.

Voluntary movement of the lumbar spine is greatly restricted and the back may be maintained in the typical sciatic scoliosis posture. Forced passive flexion of the cervical portion of the spine with the patient supine, or jugular compression, tends to increase the pain in the involved segment. It will be noted that any or all of these symptoms may be present in low-back conditions where there is no disc destruction. It is doubtful if a positive diagnosis of disc destruction can be made on symptoms alone.

Standard x-ray technic affords several findings that are indicative of disc destruction, although the ruptured disc cannot be shown by x-ray. Narrowing of the intervertebral space (particularly in the weight-bearing study), change in the size and contour of the intervertebral foramen, and an isolated lipping of the anterior margins of the vertebral surfaces adjacent to the involved disc are indications of disc disturbance (Fig. 9). The lipping is similar to that found in osteoarthritis, except that it appears only in relation to the disc involved while the rest of the spine appears "clean." Standing anteroposterior and lateral views,

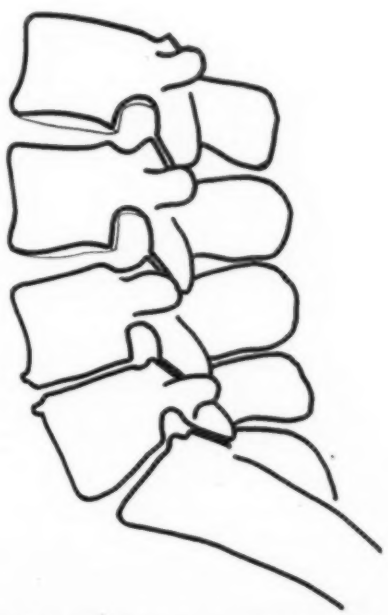

Fig. 9.—Tracing of x-ray showing lipping of the anterior margins of the vertebral surfaces when discs are involved.

supported by the required spot films, should be used in this study.

The special x-ray technics require the injection of some shadow-producing material into the spinal canal. Lipiodol is frequently used, and gives the same effect as barium in the stomach. It is an opaque medium that shows a filling defect at the site of disc protrusion. Lipiodol is a poppy-seed oil containing 40 per cent iodine in a near-stable combination, and its rate of absorption is so slow as to be practically negligible. It is aspirated under fluoroscopy, but usually some residue is left that acts as an irritating foreign body in the dural sac. It is not a completely satisfactory agent and so the search goes on for a more suitable means of diagnosis. Air injection is gaining in favor although the contrast afforded is not as marked as with lipiodol.

After definite diagnosis has been made and conservative treatment has been exhausted without the desired results, surgical intervention is indicated. (Read Dr. James M. Eaton's article in the July, 1943, issue of THE JOURNAL OF THE AMERICAN OSTEOPATHIC ASSOCIATION.[8])

Johnson,[9] in a recent article in *The Journal of Bone and Joint Surgery*, gives the following report on twenty-four cases operated upon: Herniated discs were found in fourteen, hypertrophied ligamentum flavum in seven, arachnoiditis and epidural venous varix in one each, and no pathology in one. The end results at an average of two years after operation: complete relief in twenty, partial relief in three, and no improvement in one. Other writers report more frequent unsatisfactory results and several instances of recurrence after operation.

Cases of true herniation of the disc with actual nerve pressure are undoubtedly cases for the neurosurgeon. It is doubtful if any technic can be devised to reduce a ruptured nucleus pulposus permanently. However, the symptoms arising from this type of condition are so similar to those arising from mechanical perversions that great care should be exercised in selecting the surgical cases. Every form of conservative treatment should be exhausted, and the diagnosis should be as definite as is possible.

The persistent, the recurrent, and the posttraumatic low-back cases demand the greatest skill of which the osteopathic physician is capable. Acting too promptly on the assumption that the condition is a typical sacroiliac lesion may lead to embarrassment, and possibly to further aggravation of the condition.

Careful analysis and careful planning of treatment should precede actual manipulative work on these cases. Careful analysis should include an evaluation of postural faults, palpatory diagnosis of osteopathic lesions and a differentiation between the acute and chronic lesion because of the different changes produced in the disc, and the use of indicated x-ray studies.

Postural faults which alter weight-bearing of the disc tend to produce sclerotic changes in the annulus fibrosus. Increased lumbar lordosis brings about an approximation of the posterior margins of the vertebral bodies and, consequently, increased pressure on the posterior margin of the annulus fibrosus. It has already been pointed out that the annulus is not a weight-bearing structure. Sclerotic changes take place in the tissues under this increased pressure and make them more prone to injury.

Osteopathic therapy in this condition, as in others, should be based on the Old Doctor's maxim: "Find it, fix it, and leave it alone." We have already discussed the method used in finding it; now how shall we fix it? Postural faults should receive attention from the first consultation. Anatomical variations that might bring about postural faults must be recognized and compensated for. This field includes such things as short lower extremity and developmental changes in the pelvis and lumbar spine. Postural habits that produce strains must be corrected, particularly those which increase the lumbar lordosis.

Re-education of muscles may be the most valuable service the physician can render the patient. Many of the habits developed from parental admonition during youth tend to increase the lumbar lordosis; and these, being habits of long standing and clear conscience, are hardest to correct. The child who is constantly being told to "throw his shoulders back" does so by contracting the trapezius and rhomboid groups. This requires a forward arching of the lumbar spine. This habit of squaring up is frequently carried into adult life and must be corrected. The patient is taught to raise the chest as it is raised in deep inspiration. The shoulder girdle glides posteriorly on the extended thoracic cage and the shoulders are squared with no effort on the part of the shoulder muscles. With constant coaching, a good habit is traded for a bad one.

Williams[10] has pointed out that the corrective chairs used in many offices place the lumbar spine in a state of hyperextension and so exaggerate the lumbar lordosis. There is a tendency on persons of sedentary habits for the extensor muscles to be overdeveloped and the flexors to be flaccid. This imbalance in muscle tone permits a maintained position of hyperextension, of which the individual is quite unaware. Postural exercises used in these cases should be directed toward leveling the angle of pelvic inclination and decreasing the lordosis. The anterior abdominal muscles should be improved in tone to equalize the efficiency of the extensor and flexor groups.

The individual should be taught to sit in a mildly slumped position, with the buttocks forward in the chair and the lumbar spine slightly slumped to place the greater weight load on the anterior portion of the vertebral bodies and discs. Sleeping habits are extremely difficult to control, but correct posture during sleep is as important to these patients as is correct posture during activity. They should not sleep prone because this position induces more lumbar lordosis at a time when the protective muscular reflexes are least responsive. They should sleep in a curled-up position that produces some forward-bending of the lumbar spine. This can be obtained by placing a blanket roll across the bed at knee level. This roll will elevate the knees and relieve the pull of the shortened hip flexors when lying on the back; when the patient turns on the side, the discomfort of the roll under the lateral surface of the knee will cause him to draw the knees into a flexed position.

Manipulative therapy can be a great boon or a great evil to these patients. The results obtained depend upon the good judgment and skill of the operator. Shotgun technics should be eliminated from all therapy, but they are particularly dangerous to the patient

with disc disturbance. It is necessary to correct any existing osteopathic lesions for reasons that have been explained. The correction should be obtained by correctly applied and *controlled* force. The lumbar portion of the spine should not be forced together. By that, I mean that no technic that approximates the ilium to the shoulder should be used in these cases.

The most popular technic for corrective work in the lumbar region is some variation of the old scissors movement (one leg dropped over the table, pelvis rolled forward, shoulder back). In suspected disc disturbances this technic should be used only if the fixation force at the shoulder or thoracic spine and the corrective force at the pelvis are directed somewhat away from each other. Other corrective technics that employ some degree of traction are also of value.

Traction, particularly traction with flexion, should be used extensively in these cases. Extensively does not mean indiscriminately. Traction should be applied gently, with great care as to the localization of stress, and should be released before the fatigue period of the tissues involved is reached. Traction that is maintained too long will initiate a protective spasm that will more than destroy any benefit obtained. Slow steady traction is more effective than intermittent traction. Johnson[9] has said, "Traction and trunk flexion, followed by hyperextension, may reduce some of these herniations."

It is doubtful if an actually destroyed disc can be reconstructed under any form of treatment. Relief of symptoms, compensation for the effect on total body mechanics, and adequate support to maintain the relief gained and to prevent further injury should be the aim of treatment. Braces or belts designed to reduce the lordosis are of great value in these cases. Treatment should be spaced at the intervals found best in each individual case. Too frequent manipulation, especially if it includes corrective methods, will irritate rather than relieve. Insufficient treatment will fail to produce the desired results. The rules for handling these patients, while difficult to carry out, are simple to state:

1. Make a thorough study and evaluation of the patient.
2. Understand the mechanics involved.
3. Follow a definite plan of treatment.
4. Use discretion in the application of treatment.
5. Use surgery only after all conservative therapy has been exhausted.

Williams,[10] in his article on chronic traumatic disc destruction, wrote a concluding paragraph which may be repeated here, in part, very appropriately:

"Surgery should never be employed until a thorough conservative program has overcome a fixed lumbosacral lordosis and lengthened the short hip flexor muscles . . . It has been the writer's experience that a well-planned conservative program will eliminate the need for surgery in most cases."

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WAR SERVICE CONFERENCE PLANS

The 1944 War Service Conference of the American Osteopathic Association will be held at the Palmer House, Chicago, July 14 to 18 inclusive. Following is the personnel of the executive committee of the local convention committee:

GENERAL CHAIRMAN—Daniel B. Heffelfinger, 25 E. Jackson Blvd., Chicago.

HONORARY GENERAL CHAIRMAN—E. W. Reichert, 27 E. Monroe St., Chicago.

ASSISTANT GENERAL CHAIRMAN—Earl J. Drinkall, 25 E. Jackson Blvd., Chicago.

SECRETARY—George O. Rose, 2100 Lincoln Park West, Chicago.

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FACILITIES—Charles E. Gaddie, 7825 Stony Island Ave., Chicago.

ENTERTAINMENT—Alfred C. Boehm, 5900 Chicago Ave., Chicago.

CLINICS—K. R. M. Thompson, 25 E. Washington St., Chicago.

INFORMATION AND LOCAL TRANSPORTATION—R. R. Reder, 4554 Broadway, Chicago.

PUBLIC RELATIONS—Harold R. Schildberg, 545 Lincoln Ave., Winnetka.

ATTENDANCE PROMOTION—Ralph F. Lindberg, 5250 Ellis Ave., Chicago.

ASSISTANT PROGRAM CHAIRMAN—E. W. Reichert, 27 E. Monroe St., Chicago.

Journal A.O.A.
January, 1944

Vertebral Mechanics*

C. GORHAM BECKWITH, D.O.
Hudson, New York

The recognition of the presence of a Still lesion and the treatment of the condition may be materially facilitated by an understanding of the normal as well as the perverted mechanics of the joint structures of the body. While such lesions are not restricted to joints—still less to vertebral joints—yet it is there to which we turn our attention here. There are certain generalizations pertinent to vertebral mechanics that may be applied to the spine as a whole and when modified to suit the particular characteristics of the various areas help to explain the apparent predilection of certain areas for certain types of lesions.

A joint capable of free motion up to its full range, and not beyond, is not in lesion. This does not imply that lack of mobility or hypermobility, is the sole criterion of an abnormal joint but rather that in the unlesioned joint there is no change from the normal in the tension of the supportive structures—muscles, tendons and ligaments, including the intervertebral disc—or in the component bony members. The not infrequent presence of anomalies, such as sacralization of the fifth lumbar, difference in facet facing, numerical variation, and others, may influence the activity of the joint by giving it a different normal, but in the gross picture this effect becomes an individual problem that may be considered as a modification of the general mechanics. While the restriction or the increase of motion encountered in a Still lesion is of secondary importance, it affords a means of aiding in the diagnosis of the condition and must be removed to permit a return of normal joint physiology.

MOTION

Assuming a normal development of the structures, spinal motion is predetermined by a balancing and unbalancing of force and resistance (in this sense the attempt of the joint to resist change or further change-inertia). When force (to cause motion) and resistance (tendency to remain in the same position) are equal, there exists a state of equilibrium; in this situation a joint can be considered to be relatively stable. When the force tending to produce a change is greater than the resistance offered to it, motion occurs.

Of the factors capable of producing and of resisting motion in a vertebral articulation, those to be considered within, and immediately adjacent to, the articulation are: the bony structures, muscles and their tendons, and the ligaments. Factors outside the joint are: gravity—the effects of which are necessarily met by the joint itself—and strain which is also reflected in and into the joint and its supports. In other words, from a mechanical standpoint, the effect of gravity on joint motion is that which the necessary tensions to combat it exert on the articulation itself inasmuch as the attachment of muscles and ligaments remains unaltered regardless of the position of the body.

Faults of posture, strain from other lesioned areas, or the assumption of certain positions, will be met in any one articulation by an increased tension in the ligamentous and muscular structures, by an alteration of the bony position, or by both. The articulation itself then may be considered as being capable of resisting most outside forces tending to alter its equilibrium as well as possessing the elements—muscle attachments—necessary to disturb this equilibrium. It is, of course, possible for a combination of circumstances to cause a force to enter a joint beyond the ability of the tissues to resist successfully, as it is also possible to place the joint at a mechanical disadvantage. An example of the first would be the deflection of a severe blow to the head into the cervical spine; of the second, an attempt forcibly to lateroflex a lumbar spine that has already been fully extended.

BONE STRUCTURE

Bone may be deformed as the result of continuous stress. Wolff's law is an expression of this change. But for any short period of time, bone may be considered incapable of adapting itself to any force other than that sufficient to produce a fracture. Bone itself is inherently a resistant to joint motion. The shape of the bodies of the vertebrae is for weight-bearing, except in the case of the saddle-shaped cervical vertebrae where this bone formation tends perhaps to lend stability. But even this amounts to a resistant to joint motion. The articular facets guide and control motion—in no sense introducing, but rather resisting it. The osseous members of a joint tend to remain where they are unless acted upon by some force. The element of contact of the articular surfaces of the bones—indirect in the sense that articular cartilage and disc separate them—tends to make for stability even though the presence of synovial fluid and the nucleus pulposus do tend to facilitate motion. Force applied to bone is deflected at least partially so that the natural resistive forces can minimize its effect.

MUSCLES AND LIGAMENTS

In the production of spinal motion, then, the muscles and ligaments become most important. Bone, being relatively inert and capable of activation only from the action of attached structures capable of contraction and relaxation, becomes a vehicle for joint motion rather than a factor for its production.

In considering the forces and resistants concerned with joint motion, it becomes necessary to alter the usual textbook consideration of the ligamentous structures. The spinal ligaments, except the ligamentum flavum, are composed chiefly of white fibrous tissue which is usually considered as capable only of resisting change. Yet, if the ligaments did

*Presented at various times before the Osteopathic Society of the City of New York, the New Jersey Osteopathic Society, and the Ohio Osteopathic Association of Physicians and Surgeons.

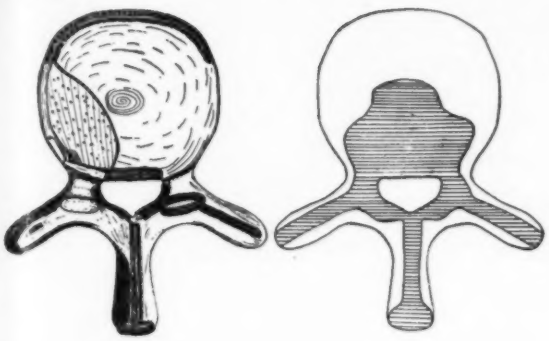

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Fig. 1.—Ligamentous attachments—diagrammatic.
Fig. 2—Resistance offered by ligaments with joint in flexion.

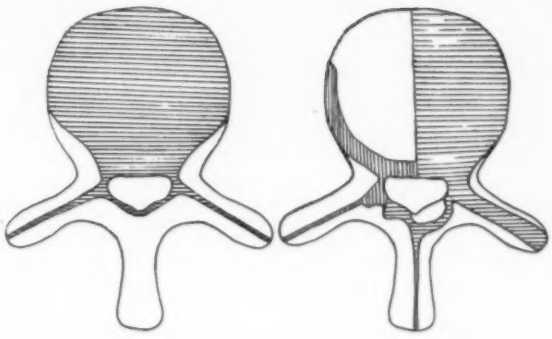

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Fig. 3.—Resistance offered to extension.
Fig. 4—Resistance offered to lateroflexion to the left.

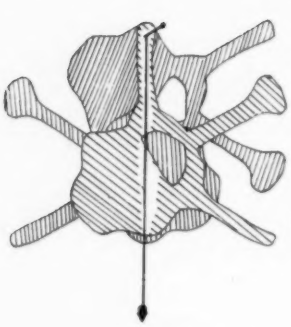
not possess the ability to return to their former state, they would soon be stretched beyond the point of usefulness with joint motion. In other words, a ligament must return to its original state when the occasion for joint motion has passed. To assume that these structures have the ability to return to their original state after having been subjected to a deforming force is not to imply that they have the power to contract except to the extent necessary to restore their shape. They cannot produce motion with the joint in a relatively normal position, but can exert a force in the way of resistance to any attempt to produce motion beyond certain limits. A ligament must exert some force to maintain the equilibrium of a joint even when it is in neutral position or at ease. The additional stability afforded by the slight tonicity of the supporting muscle structures further enhances this equilibrium. Given a joint in equilibrium, in order to introduce motion, it is necessary that the force be increased in the muscles on one side, while there is a corresponding relaxation in their antagonists. Once this increase in force is introduced, there is little to interfere with or restrict it until the normal limit is approached or until the muscles are placed at a mechanical disadvantage. In rotating the head, for instance, it is not much harder to pass through the 10 to 15 degree range than it is the 5 to 10 degree range or excursion. However, when the 60 degree angle is reached, there is required a definite effort to retain the head in this position. Beyond this arbitrary point it becomes progressively more difficult to continue and maintain the rotary motion. Yet the ligamentous structures of the atloaxoid articulation are not such that when the joint is at rest they could be compared to an half-empty sack of potatoes lying on the ground. Possibly this is an unfair example, but let us consider the elbow or the knee in their ranges of flexion and extension. Though fairly easily palpated, the ligamentous structures of such a joint at no time in the full excursion seem to curl up and be superfluous. Ligaments are capable of meeting a deforming force and resisting it with a variable degree of efficiency until the limits of permitted motion are reached. It is a common observation that bone will generally break before ligaments will tear.

The inflammatory process associated with a lesion involves all the joint structures, some more than others. The ropy feel of the muscles in a chronically lesioned articulation is evidence of a fibrotic infiltration. While it is not possible to palpate the ligaments surrounding an intervertebral articulation, the restriction of motion encountered in the chronic lesion indicates their involvement by a similar process. While scarification of muscles could modify their ability to contract and relax, it is hardly conceivable that the change would usually be sufficient to modify joint mobility seriously. The ligaments, playing a role in restricting joint motion, become the structures to be altered by treatment in order that a more nearly normal motion may be permitted in the articulation.

CENTER OF MOTION

In the final analysis of joint motion, it is the force that muscles can exert and the resistance that ligamentous structure and antagonistic muscles can offer, that determine the amount and range of motion. In the motion of forward bending or flexion of the spine, for example, a number of muscles may contract, some acting directly on the bones, others acting indirectly—the rectus abdominis for instance. It would be difficult to estimate the amount of force exerted by the rectus abdominis through the ribs, eventually affecting the vertebrae. The calculation of the resistive forces in a joint becomes simpler to the extent that the ligamentous and direct muscular attachments are known (Fig. 1). As tension is applied to a ligament, the actual size of the ligament does not change, though its shape may do so. This change in the shape of the ligament is then a concomitant of the tension, or the change in area offering resistance is a concomitant of the stretch: it may be computed as a greater area of action.

These tensions or resistances were estimated from a study of radiographs taken of healthy young adult females who had assumed extreme positions of flexion, extension, rotation and lateroflexion after being radiographed in the normal or easy anteroposterior and lateral positions. Each subject studied for lumbar mechanics, for instance, would undergo all the lumbar motions. Study of the radiographs indicate which structures were tensed and which were relaxed. In an attempt to study this relation, large scale cardboard models of vertebrae were made with the articular surfaces varied in size and shape to correspond to the ligamentous and muscular resistances. These models were about three feet in size, the final



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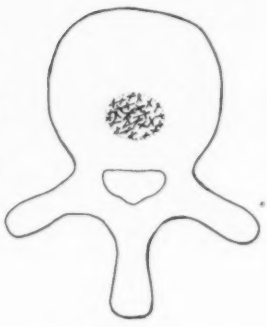

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Fig. 5.—Model for resistance to flexion suspended from different points.

Fig. 6.—Sites of intersection of plumb lines for figure in different positions.

model representing the forces that were offered to resist various motions. For instance, in the case of flexion, the resistance offered by the supraspinous and interspinous ligaments becomes very great. That part of the model representing their action would be relatively great while the action of the intervertebral disc—particularly the anterior portion—would be correspondingly very slight (Fig. 2). In the model representing extension (Fig. 3), the resistance of the anterior portion of the intervertebral disc would be very powerful. Add to this the anterior longitudinal ligament and the resistance in this area of the model would become very great while the effect of the supraspinous and interspinous ligaments would be practically nil. For lateroflexion (Fig. 4), to the left for instance, the action of the right intertransverse ligament and the right half of the intervertebral disc would be very extensive while that of the left intertransverse ligament and the left portion of the intervertebral disc would be absent, as represented on the model.

Cut-out models for rotation as well as combinations of the motions were made. By suspending models of the cervical, dorsal and lumbar spines on a pin in a vertical surface, and allowing them to hang free, the course of a plumb line dropped from the point of suspension (the pin) was marked on the model (Fig. 5). By allowing the models to hang free from the point of suspension, the course of the plumb line must divide the figure into two equal halves regardless of the shape. Also there must be an equal distribution of the figure (representing stresses) to either side of the plumb line regardless of where the pin is placed for the point of suspension. The point where the various plumb lines cross each other locates the center of motion that is possible with the resistive forces in a joint.

Superimposing the centers of motion on the original model, the location of these points for all spinal motions—flexion, extension, rotation, lateroflexion and combinations of these—met in an area that correspond to the location of, or the possible excursion of, the nucleus pulposus (Fig. 6). The center of motion of an intervertebral articulation would be represented by a point that would shift as different motions entered the joint, but which would always lie within the nucleus pulposus or its possible range of motion. This would hold true not only in those cases in which there is equilibrium, but also in those cases in which the equilibrium has been upset, inasmuch as the only resistance that can be offered to counteract this is inherent in the supportive structures of the joint itself.

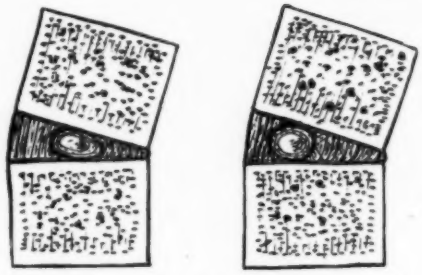

Fig. 7.—Possible shifts of nucleus pulposus.

Beadle[1] has observed that the nucleus is under pressure from its own elastic turgor and while the strength and tenacity of the disc is derived from the annulus, "The nucleus . . . distributes, not tension, but pressure over the vertebral surfaces and resembles a cushion, upon which each mechanical shock of functional life impinges, is distributed and absorbed."

The consideration of the nucleus in the same light as that of any other ligament—as capable of distributing and redistributing forces applied to it—is in keeping with the concept of it as a ball-bearing over which the vertebra moves. With a lateroflexion of the upper of two vertebrae, as viewed from the back, the nucleus could move toward the convexity, or it can change its shape to permit a bulging into the convexity (Fig. 7). While there is probably a tendency for both of these changes to occur, there is actually a lot more to lateroflexion than this change in the nucleus.

LATEROFLEXION AND ROTATION

The relation of lateroflexion and rotation is an interesting study. Most texts state that these motions are complementary. From observation of the changes that occur in vertebral articulations, it is evident that one motion is rare without the other. Subjecting the motions to analysis indicates that there is a constant pattern for normal or physiological motion. A theoretical consideration of the change that occurs in the case of a pure lateroflexion may be exemplified by the use of a figure of equal and homogenous density of eight equal squares, two squares high and with a base of four squares (Fig. 8). Regardless of the position of the figure, an equal distribution to either side of the line of gravity will occur and will be represented by four squares. If the figure is tilted to 45 degrees the center line of gravity will pass through the quarter mark on the bottom and the three-quarter mark on the top.

Without any rotation in a vertebral articulation, this shift of the center line of gravity would occur to the concavity of the produced curve. This unbalancing is counteracted by a rotation of the vertebral body toward the convexity. These rotary and lateroflexing motions are coexistent and coextensive. *With a primary lateroflexion, rotation occurs normally to the convexity.* (Fig. 9).

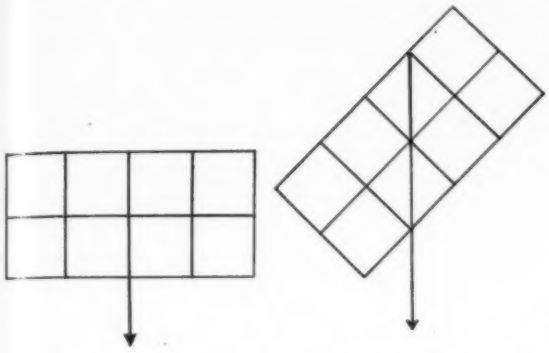

Fig. 8.—Change of line of gravity with lateroflexion.

If rotation is introduced primarily, a similar balancing of forces results in the same final change, but by a different mechanism. With a rotation to the left, for instance, the anterior portion of the vertebra or body moves to the left while the spinous process moves to the right. As this motion continues the weight-bearing portion carries the center of gravity to the left and in so doing would unbalance the joint. To counteract this, lateroflexion to the right would realign the center line of gravity (Fig. 10). *With a primary rotation, there occurs normally a lateroflexion to the opposite side.*

Inasmuch as the end result of the introduction of either rotation or lateroflexion is the same, a general statement can be made: *Rotation normally occurs to the produced convexity.*

The presence of flexion or extension at the time of the introduction of these motions modifies only the extent of rotation and lateroflexion. Rotation may be introduced as a primary motion, followed by its complementary lateroflexion; lateroflexion may be introduced as a primary motion followed by its complementary rotation; either may be introduced with the spine in extension, easy normal or flexion position.

GROUP LESIONS

While the spinal motions just described are normal in the sense that they represent the easiest and best means whereby the spine can accommodate to motion and strain, this accommodation can become abnormal. Faults in weight distribution demanding compensation are most easily met by a dissemination of the force to several segments. This change is recognized as a scoliosis. In our daily activities, the vertebral column assumes positions that are momentarily a scoliosis innumerable times. With each step there is introduced a need for scoliotic changes, but on the resumption of a state of rest or balanced stance, the inherent muscular and ligamentous strength obliterates the curves that occur in the lateral planes. If, however, an unbalancing force is sufficient and continues long enough to overcome the resistance of the ligamentous and muscular supports, compensation must occur, preferably in the form of a scoliosis. In this instance there gradually develops a curvature that represents an excess of forces. The continuance of the deforming stress is finally arrested when ligamentous and muscular supports can successfully meet it. In the meantime, variably severe inflammatory processes have been accompanying the

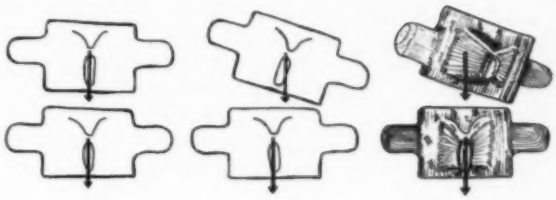

Fig. 9—Changes from primary introduction of lateroflexion.

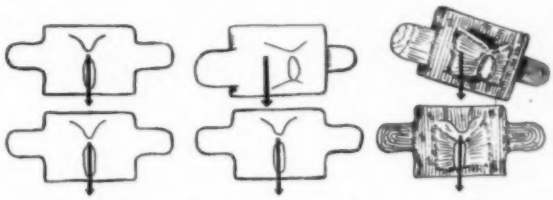

Fig. 10—Changes from primary introduction of rotation.

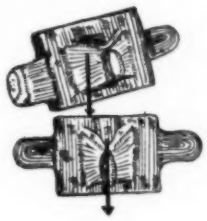

Fig. 11.—Rotation into the produced concavity (single lesion).

changes which are recognized by the palpating fingers of the osteopathic physician.

SINGLE LESIONS

While there is a distinct tendency for the changes just described to involve several segments of the spine—thus the term group lesion—there is another change that occurs, and frequently, which involves but one intervertebral articulation. This has variously been called the single lesion, the extension, flexion or rotation lesion. This type of lesion is rather easily comprehended if the mechanics of the group or scoliotic lesion is understood. The choice of the vertebral column in making accommodation is the change that might be termed a permitted movement—a lateroflexion with a complementary convex side rotation or a rotation with its complementary lateroflexion to permit a convex side rotation—a rotation of the vertebral body into a produced convexity. In the production of single lesions, rotation occurs to the side of the concavity (Fig. 11).

This rotation into the concavity is not normal and when it occurs places undue strain on the soft tissue supports of the joint. An example of how this may happen is the case in which a man reaches over to pick up an object from the floor. The usual method of producing this single lesion is for him to bend forward, reach to the right—in so doing introducing lateroflexion to the right—and lift upward to introduce rotation to the right. This motion is not normally permitted. With rotation directly opposite to the direction the joint is designed to accommodate, the violation results in the production of ligamentous and muscular strain and the development of one of the most common lesions. If the man had picked up

the object with his left hand and lifted it in such a manner as to introduce rotation to the left (into the produced convexity) little or no trouble need have occurred unless his force had been violently excessive.

To summarize these two types of lesion: one (group lesion or the scoliosis) occurs as the result of the introduction into a joint or joints of force that is permitted, but in excess of the ability of the soft tissues successfully to resist; the other (single lesion) results from the introduction into a joint of force in violation of the permitted mechanics.

The terms "extension," "flexion," and "rotation" have frequently been used to describe the single lesions, for the reason that one or another of these conditions is variably prominent. As a matter of fact, lesions of this type usually include a fault of either flexion or extension as well as the complementary motions of rotation and lateroflexion. Because few acts are accomplished with the body in the easy normal position, either flexion or extension is usually present. The restricting effect of the prior introduction of these motions usually plays a role too. The prominence of the posteriorly rotated transverse process has probably given rise to the term "rotation" lesion. While none of these terms is truly suggestive of the single lesion, their use is generally understood.

While the group lesions present little or no change in flexion or extension, one or the other of these motions is usually present in the single lesion. While rotation is present in both types of lesion, it occurs to the side of the produced convexity in the case of the group lesion, to the side of the produced concavity in the single lesion.

Steindler[2] says: ". . . a rotation to the concave side accompanied by lateral bending is not in harmony with the mechanical propensities of motion; in other words, it does not represent the easy and natural route; rather, it is evidence that against this natural inclination of the spine antagonistic rotary forces have been set to work which move the spine in contravention of a predestined path." While Steindler considers ". . . concave side rotation as proof that the spine is adequately and fully controlled by its musculature," osteopathic physicians find that it frequently is a Still lesion with its associated pathological changes.

While concave side rotation can and does occur without the production of changes serious enough to produce lesion, its range is slight and continuation of the motion is fraught with rapidly increasing strain.

The convex rotation utilizes a minimum ligamentous and muscular support to keep the joint in balance with the result that changes in the position or shape or both of the nucleus allows most of the weight to be borne by bone. Up to a certain limit—and this is great in comparison to the concave rotation—the continuation of rotation into the convexity is met by balancing until finally the ligaments and muscles are assuming all the strain.

On the other hand, concave rotation soon displaces the center of gravity to the possible limits of nuclear change and not only places strain on the muscles and other ligamentous supports, but also on the disc itself. Lacking osseous support, the strain is much greater on the soft tissues and is evident much sooner. The rotation permitted has but a slight range and any exaggeration beyond these narrow limits is accompanied by severe strain. *Lesions result from an excess of or a violation of permitted motion.*

OTHER LESIONS

While almost every lesion can be classified as either a group or a single lesion as already discussed, there are other conditions that exist. One or more of the vertebral articulations may be held in partial fixation in a position of flexion or extension. This type of lesion is partially prone to occur in the thoracic region of the spine. The modified flexion could perhaps be described as a posterior condition, while the extension could be called an anterior condition. Occasionally, too, there appears what seems to be an anterior or a posterior position of one vertebral body in relation to another.

DIAGNOSIS

It is not the purpose of this discussion to detail the diagnosis of the lesion except to indicate the grossest needs. The diagnosis of the lesioned condition implies more than the determination of the position of the bony segments. After the presence of flexion or extension (either likely to occur in single lesions) or their absence (usually in group lesions) has been determined in an area presenting recognizable changes in the overlying tissues, the relation of rotation and lateroflexion must be determined. While this information permits the visualization of the change in bony position, it is but part of the picture. The exact localization of the pathological condition most responsible for the perversion of joint physiology is equally important as the knowledge that the lesion is the result of force in excess of the ability of the tissues to resist or in violation of the permitted motion. It should be determined whether treatment should be directed to the anterior facet, the posterior facet, the ligamentous or muscular structures on one or the other side of a joint, the disc, the anterior longitudinal ligament, or any of the several possible sites of change. The careful and painstaking estimation of the exact nature of the inflammatory changes will aid materially in treating the abnormality with a minimum effort and a maximum result. Lesions of the different areas of the spine are expected to be at some variance, one with the other. Lesions in the same area of the vertebral column should be analyzed for differences as well.

CERVICAL REGION

Just as there are certain gross facts that may be used for a discussion of lesions in general, so are there some considerations of the various regions that may be used as a general guide. A normal individual can flex his head until his chin touches his chest. He can rotate his head until his chin overlies the acromioclavicular articulation. Lateroflexion is permitted until the ear touches the shoulder. But not all these are strictly cervical motions. Nodding is accomplished in the occipitoatloid articulation, rotation is chiefly an atloaxoid motion. Lateroflexion is, however, a distinctly cervical motion. It is characteristic of the cervical spine that most restrictions in motion occur as a result of a fault in rotation. Occasionally "sideslip" is a complicating factor. In the cervical spine, flexion, extension and lateroflexion are comparatively free.

THORACIC REGION

Flexion is freer than extension in the thoracic spine, but in itself is not great. This relative restric-

tion of motion perhaps accounts for the changes in anterior and posterior positioning previously mentioned. Rotation is comparatively free whereas lateroflexion is restricted. While the presence of the ribs in part complicates this motion, its restriction makes it most prone to involvement in lesions of the thoracic area.

LUMBAR REGION

Flexion and lateroflexion are the free lumbar motions with extension restricted and rotation practically absent. This absence of rotation is most frequently the fault in lumbar lesions.

SUMMARY

The production of osteopathic lesions results from force entering a joint in excess of its ability to resist or in violation of the permitted mechanics of the joint.

The pathological physiology in lesion varies, thus requiring a careful analysis of the soft tissues as well as the bony components of a lesioned joint.

Rotation is most prone to be restricted in cervical and lumbar lesions, lateroflexion is most prone to be at fault in thoracic lesions.

5 East Court St.

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Principles Governing the Treatment of Cardiac Conditions

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South Pasadena, Calif.

It is self-evident that the rational treatment of any disorder must be based upon three factors (*a*) the normal structure and function of the affected tissue (*b*) the insult which disturbed such structure and function, and (*c*) the ability of the injured tissues to react to treatment.

In general we cannot expect to restore injured tissue and have it in better condition than in its so-called "normal" state, before the injury. The aim of treatment should be to restore so far as possible the relations of structure, circulation and innervation present during normal activities of the affected tissue cells, and if restoration is impossible to provide some form of compensation.

The gross anatomy of the heart is well known. Our knowledge of its minute anatomy and of the functional relations of its parts remains vague. At the present time, one crying need of osteopathy is a better knowledge of cardiac physiology and pathogenetic relations.

The chemical activities of the myocardium have received much attention during recent years. Varying amounts of sympathin and acetylcholin (produced during the activity of the sympathetic and the parasympathetic nerve endings) seem to explain certain cardiac puzzles, but they also open new fields for investigation. Varying amounts of calcium, potassium and vitamins in the circulating blood seem to cause certain changes in the force and the rhythm of the pulse. The findings reported for much experimental study of the myocardium and its nerves are inconclusive and often contradictory. Therefore, adequate prevention and treatment of cardiac diseases must await further study.

There are certain structural changes in the heart, as in other tissues, which are known to be essentially incurable. Recovery of efficient function of an organ so injured or diseased must be secured by some form of compensation. In the heart, a valvular injury or stenotic narrowing of an orifice is now considered permanent. However, fairly normal systemic circulation can be secured by a heart so injured when the myocardium becomes correspondingly strengthened. The heart is larger in nearly all such cases. The cavities of the heart may or may not be moderately dilated.

Surgical treatment of cardiac diseases or injuries rarely is indicated, and needs no discussion in this place. So far as the general practitioner is concerned, treatment of the heart means development of the myocardium. Like any other muscle, the heart requires alternate periods of rest and activity. These must be carefully graded during treatment.

Abnormal conditions of the heart are many. Congenital abnormalities may be so profound as to prevent continued life, or so slight as to cause little or no recognizable functional disturbance, or they may be of moderate degree, in which case the patient can live comfortably so long as no unusual demand is made upon the heart or the systemic circulation. In this case suitable treatment may be useful, partly in facilitating developmental changes, partly in securing compensation.

The pericardium and the endocardium are subject to infection and resultant pathological changes. Treatment during the acute stage depends upon the patient's reaction to the infectious agent. The heart can be protected. After the structural changes due to the inflammation have developed, little can be done except to secure fairly adequate compensatory changes.

Sclerotic changes in the cardiac tissues and in the blood vessels of any significant area of the vascular system or of the heart itself present many puzzles. We have no satisfactory understanding of the essential causes of sclerosis nor of the factors which localize that process. Many causes have been suggested. It is quite possible that many different ones exist in different patients and that there is no single essential cause. In this field (the causes and the pathogenesis of sclerosis) there is great need for osteopathic research. The treatment and prevention of cardiac diseases associated with abnormal blood pressure, renal disease, pulmonary disease, and arterial sclerosis cannot be completely adequate until such research work has been carried on. For the present, treatment is chiefly devoted to hastening compensation.

The myocardium is subject to infection, but is more often found diseased by the toxic products of infectious agents and the toxic catabolites from in-

jured or diseased tissues. Toxic products of infectious processes and toxic catabolites from diseased tissues may cause circulatory and degenerative changes in many tissues, including the heart muscle.

Lesions of the third and fourth thoracic vertebrae and the corresponding ribs affect the cardiac circulation in experimental animals and petechial hemorrhages occur abundantly.

A resumé of myocardial conditions following lesions of the third or fourth thoracic segment is of interest in this connection.

Slides made of a rabbit heart affected by a lesion of the third or fourth thoracic vertebra produced six months or so before death, show many recent hemorrhages, many areas in which the extravasated red cells are partially digested, and many minute masses of connective tissue fibrils, whose origin on the sites of older hemorrhages is indicated by the presence of a few partially digested red or white blood cells or by a faint brownish stain left by degenerating hemoglobin.

The striations of the cardiac muscle cells are less distinct in the heart which has been affected by vertebral lesions. The normal cardiac muscle has a centrally placed nucleus, with no striations in its immediate neighborhood. The periphery of each normal muscle cell shows striations which are less distinct than are the striations of skeletal cles, but are quite easily recognizable and are uniform in structure. The muscle cells of the heart which has been affected by vertebral lesions shows cardiac muscle nuclei occasionally abnormally situated or undergoing karyokinesis, and striations irregularly arranged and often almost or quite invisible.

It is not to be inferred that no other lesion causes these hemorrhages, nor that diseases may not cause similar pathological disorder in nonlesioned subjects. We do know that experimental animals with these lesions show the condition described, and that these experimental animals were not subject to other lesions nor to any disease. We know also that other possible causes of this type of myocardial disease were sought but not found in certain human subjects at autopsy.

Human patients and experimental animals with lesions of the third and fourth thoracic vertebrae, showing evidence of chronic noninfectious myocarditis, have been treated by osteopathic physicians and the lesions corrected. Thereafter the symptoms have diminished gradually and the function of the heart has seemed to be normal.

Post-mortem examinations have been made of the hearts of rabbits which were lesioned, then treated, then allowed to live normally for varying periods of time. Such a heart has shown digestion and absorption of extravasated blood. No recent hemorrhages were found. Minute connective tissue masses remain.

Human subjects cannot be studied in such detail, but the manner in which symptoms diminish indicates that human recovery probably follows the same general course of events.

These pathological findings indicate the treatment. The minute hemorrhagic areas change to normal by the coagulation of the blood, its digestion, absorption and removal. Coagulation occurs within a few days or a few hours, and depends upon the presence of certain enzymes and minerals which are present in normal blood serum. Digestion of the clot occurs as a result of fibrinolytic and other proteolytic enzymes present in normal blood serum. The products of the digestion of the blood clot are absorbed and removed by blood flowing normally through the affected areas.

It is evident that the normal activities of enzymes present in normal blood circulating normally are needed for return to normal structure of the myocardium.

If the myocardial injury be severe, some muscle cells may be unable to recover; they have been found dead or dying in our slides. In such a case they may be digested, absorbed and removed, as are the erythrocytes of the hemorrhagic areas. This is shown by the fine fatty granules found within injured myocardial cells, and in masses whose contour suggests myocardial cells. They have been found lying free, with no evidence of relationship with one another, and have been found, very scantily, within the venous capillary area and within the venules of areas occupied in part by dead or dying myocardial cells. These conditions appear in our slides. It is evident that digestion and removal of such injured cells is best promoted by the normal circulation of normal blood through the affected areas of such injured tissues. Myocardial cells remaining alive thus have an opportunity to recover.

Certain severe functional disturbances in cardiac rhythm follow lesions of the atlas and adjacent tissues, probably acting by way of the vagus nerves and the superior cervical ganglia. (It is known that such lesions produce edema of the tissues surrounding these nervous structures.) Such a lesion often causes a grouped type of irregularity. The pulse beats several times quite rapidly, then several times quite slowly, then again there are several rapid beats, and so on. The number of beats in each group usually varies from time to time. Both the sphygmogram and the electrocardiogram show the variations. In nonosteopathic publications the variation usually is referred merely to a disturbance in the function of the vagus.

Patients with lesions affecting both the upper cervical and the upper thoracic segments may not show this peculiar rhythm. Experimental animals with lesions of the atlas alone showed the grouped irregularity, but if these same animals later developed upper thoracic secondary lesions, the vagal effects usually disappeared.

METHODS

Methods of handling patients suffering from heart disease have been studied. These were obtained from one hundred osteopathic physicians directly questioned, from two hundred lectures given at osteopathic meetings and from fifty published articles and case reports. Published records and nonosteopathic reports of interest in this connection are included in the bibliography (not published but on file at the American Osteopathic Association's office).

Osteopathic care has been found surprisingly uniform except in regard to the use of certain drugs in selected cases. Digitalis is used in certain conditions by about one in ten of the osteopathic speakers or writers whose discussions indicate an opinion. Rarely other drugs are mentioned as being of value.

From records of the Clinics of The Pacific College of Osteopathy and of The A. T. Still Research Institute the following account of osteopathic methods has been collected. These methods do not differ significantly from the methods described in other available osteopathic literature, except as noted above.

A sudden attack requires immediate and complete rest, with treatment based on symptoms. If the previous condition of the patient is known, if the condition suggests shock, injury, cardiac or cerebral insult, treatment adapted to these conditions, of course, is indicated.

Tissues around the sixth cervical vertebra and those passing through the thoracic inlet very often are found tense and palpably edematous. The gentle treatment of these tissues, expressing fluids and relaxing the tense muscles, is advised. The results of such treatment may be spectacular.

Prone position, inhibition of splanchnics, removal of heavy or constricting clothing, all relieve some of the burden on the heart. Pallor, weak pulse, tension of deep spinal muscles in upper thoracic region, call for slow and gentle relief of tension and raising of upper ribs. Very irregular pulse, groups of rapid beats alternating with groups of slower beats, tension around upper cervical region, call for careful relief of that tension. Great pallor with palpably low blood pressure, with a pulse beat not too feeble, calls for examination of the lower thoracic segments. Relief of any tension of the deep spinal muscles of this region may be made rather rapidly. If tissues are palpably soft and flabby, rapid movement of the vertebrae may increase the tone of these muscles and of the abdominal muscles, blood vessels and viscera. In some degree, a normal blood pressure and circulation may thus be restored.

As quickly as is practicable, the patient must be put to bed, diagnosis made as quickly and accurately as conditions permit, and treatment determined thereby.

Examination of the spinal tissues can be made at once. The presence of reflex contractions in any spinal region is most important. Lesions may or may not be present. Disease of other than cardiac tissues may be the cause of the symptoms or may exacerbate cardiac disorder. Any viscus which is seriously diseased tends to cause reflex muscular contractions in the spinal regions corresponding to the innervation and the embryonic segmentation of that viscus. Exceptions are rare. The recognition of abnormal palpable spinal conditions usually is the earliest possible diagnostic factor in difficult cases. The importance of this method of diagnosis cannot be overestimated. More than any other method or group of methods, spinal reflexes have led to correct and early diagnosis.

After diagnosis has been made, the care of the acute and the chronic patient is much the same.

It is axiomatic that recovery of any patient depends upon his reaction to treatment rather than to the treatment itself. Hence there is need for a method of treatment based upon the ability to recover as well as upon the disease present. This means that the art of treatment includes the use of methods which employ, without exhausting, the recuperative powers of the individual patient.

The ability of the patient to react to treatment depends upon several factors. The treatment itself and the manner in which it is given constitute only one factor to be considered. Generally speaking, the patient who obeys directions without rebellion, who rests comfortably, sleeps well, enjoys the foods given him and finds interest and occupation despite his necessary limitations, recovers from any abnormal condition more rapidly and quickly than the complaining, bored, sleepless person or the one whose indigestion, constipation and physical discomfort keep him irritable. On the other hand, the patient whose excessive saintliness arouses admiration may fail to react efficiently and so become a happy martyr to illness despite any treatment.

The bed and the manner in which the patient sleeps are of importance. Lesions may recur because the bed sags, or is too soft, or too hard, the pillow too high or too low or too soft or not soft enough. The manner in which the light shines and the wind blows upon the patient may cause attitudes which cause or perpetuate lesions.

All these factors, and may others, may have an influence upon the power of the patient to react to treatment. Especially in cardiac conditions, these small items may affect recovery.

If the heart itself has been injured, whether or not complicating disorders are present, complete rest is necessary until there is reason to believe that the heart muscle is able to meet demands imposed by light exercise.

In the clinics from which these directions were taken the patient rarely could afford the nursing necessary for complete rest. Usually, as the least of necessary evils, he was permitted to use a bedside commode rather than the difficult bedpan. If necessary he took only liquid foods by means of a bent tube, but as soon as the condition of the heart permitted, he was allowed to chew and eat solid food. Even one light meal each day, eaten with ease, was found to give comfort and aid recovery.

In general practice, when skillful nursing or hospitalization is practicable, rest may be more nearly complete. Some of our clinicians enforced almost complete inertia, physical and mental, until some cardiac improvement was recognizable.

After some days or weeks, depending upon the diagnosis and the patient's reactions to treatment and rest, exercises involving the feet are advised, then those of the hands, then of the legs, arms and body in turn. Then he may be around the room and may, at the end of one or two years, return to his ordinary manner of life.

At any time, recurrence of cardiac symptoms must be followed by rest as in the first days of illness. This regime was successful in all cases in our clinics except those with the severest cardiac disorders.

The child who grows too rapidly puts a severe burden on his heart. The addition of a few inches of body height increases the power exerted by the heart by several ounces at each beat. Therefore a growing child with cardiac disease must be kept in a reclining position for a longer time than an adult.

In chronic and in complicated cases diagnosis may be very difficult. Recognition of vertebral or

costal lesions and regions of spinal tension helps in diagnosis, in complicated disorders. Methods of palpation must be gentle, since any harsh measures may cause further cardiac embarrassment.

Diagnosis of the condition of the heart may be established by the symptoms and by palpation, auscultation and history in many cases. X-ray examination of the beating heart, x-ray plates of the heart at a certain stage of its beat, and electrocardiograms may establish the diagnosis in more difficult cases. The sphygmograph is not commonly used since the development of the electrocardiograph. Other methods of diagnosis are useful in the recognition of the general condition of the patient, and sometimes in the diagnosis of the cardiac disorder. These include blood cell counts and blood chemistry, urinalysis and studies of blood pressure under varying conditions. Many other laboratory tests are occasionally useful.

Generally speaking, the correction of abnormal structure is considered of first importance in treatment. Lesions of the third and fourth thoracic vertebrae, the third to the fifth ribs, the atlas and axis, the sixth cervical vertebra and the first and second ribs were found of etiological importance in our clinics, in order of frequency.

In records of our clinics, uncomplicated lesions of the atlas or axis, or both, are often found associated with disturbances in the rhythm, while the third and fourth thoracic lesions are more often present when the pulse beat is especially feeble or slow. The nervous relations of these tissues probably explain the difference in the symptoms produced.

Lesions affecting the thoracic inlet probably affect the heart through pressure. It is evident that the normal position of the first and second ribs, at a right angle to the first and second thoracic vertebrae, provides the largest possible size of the inlet. Any abnormal position of the first rib diminishes this angle, hence diminishes the size of the thoracic inlet. Thus pressure is exerted upon the common sheath of the vagus nerve, the jugular vein and the pulsating carotid artery. For a time the vagus may be stimulated by the strong pulsation of the slightly compressed carotid, but with continued stimulation the nerve cells so affected become fatigued and the action of the vagus diminished. Various reflex actions follow. These have been studied in some detail and the findings are of great interest, but for the present it is necessary only to call attention to the importance of correcting any lesions which may affect the upper thoracic centers of the spinal cord, the sympathetic ganglia, the vagus centers and the nerve fibers which carry impulses to and from these nerve centers.

Other structural disturbances which cause, exacerbate, or perpetuate cardiac disorders are many. Obesity, weak and atonic musculature, large, pendulous abdomen, these are a few soft tissue lesions which lay increased burden on the heart. Lack of exercise with resultant feebleness of the skeletal muscles is associated with similar weakness in the heart and in nonstriated muscles. Deficient diet may have the same effect. All these factors should receive attention during the period of recovery. Usually such abnormal conditions should be corrected in turn, with due consideration for the recuperative ability of the patient. After the lesions have been corrected and the heart has increased in strength, the diet can be balanced with regard to vitamin and other needs, and to patient's weight. Later, increased exercise comes within the scope of comfortable living for the patient. The proper timing of all methods of treatment is an important factor. The patient's reaction to treatment is a criterion of value.

Functional cardiac disorders may persist for considerable periods of time with little or no evidence of disease. The vertebral lesions mentioned do not seem to cause severe organic change for some time after the symptoms appear. The speedy relief noted after correction of such lesions in recent cases shows that cardiac disease cannot have been incurable, or at least not beyond easy compensation.

Neuroses, with or without lesions, may require treatment. The place of conditioned reflexes in the cause of functional disorders requires further study, but in cases of difficult diagnosis the existence of conditioned reflexes affecting the heart should be considered. Disorders which are essentially functional, including those of reflex origin, do not cause death in themselves, but the heart may become affected by serious pathological changes if any abnormal function persists, especially if the vasomotor control of the cardiac vessels is affected. This is the reason why so many patients whose cardiac disorders seem to be functional for many years, finally die of actual heart disease.

SUMMARY

Briefly, it may be said that recovery from cardiac disorders depends upon two chief factors: the nature of the cardiac disease and the reaction of the patient to treatment.

Methods of treatment include two chief factors: removal of causes of disturbed function, and establishment of compensatory increase in myocardial activity.

Prevention of cardiac disease depends chiefly upon the correction of lesions and the removal of excessive burdens upon the heart and related tissues.

It should be emphasized also that neither the prevention nor the adequate treatment of cardiac disorders can be really adequate until much research work has been done upon the histology and the physiology of the heart.

(Bibliography will be furnished by request to the Editor of THE JOURNAL.)

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It is a mistake to accept minor changes in the electrocardiogram as proof of heart disease and so inform the patient, thereby running the risk of starting a neurosis that may take months or years to overcome. Patients are sometimes told that they have heart disease, when the opinion is based on an electrocardiogram that, according to . . . present standards, is within normal variations. Such an error may play havoc with the peace of mind of both the individual and his family.

There is a tendency on the part of some practitioners to depend too much on the electrocardiogram and to neglect the clinical picture. The training of one who reads the curves is of vital importance.—J. M. Bamber, M.D., *New Orleans Medical and Surgical Journal*, 1943 (May) 95:501.

Management of Extremity Wounds as Practiced in War Surgery*

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Wounds that occur in this present World War do not fall within any particular classification, as did the wounds of World War I or as do those commonly found among civilians. The great percentage of current casualties of this war are the result of bomb fragments and machine gun bullets. There is no special clinical gain in classifying wounds by indicating the effect of such missiles, such as penetrating, perforating, incised, contused, etc. The essential of war surgery is to combat the three associated dangers of trauma: shock, hemorrhage, and infection. Shock and hemorrhage are best treated by such means as external heat and fluid, and the use of whole blood or liquid or dried plasma. It is the belief of many that before World War II is over, stored blood will be used commonly in the form of capsules or tablets, and perhaps even animal blood, through some modification, will be used safely.

The treatment of war wounds has two main objectives: (1) to prevent infection, and (2) to promote healing. It is known that organisms survive easily in the presence of dead or dying tissue. From this fact we can deduce that if we can maintain living tissue we can be assured of dead germs, irrespective of the size, site or source of the wound, anaerobes, of course, being the exception. Furthermore, we know that in considering the treatment of wounds we must recognize two phases: (1) contamination, (2) infection. Therefore, the time element is important. Long ago it was learned that early treatment of trauma usually meant good results but if the treatment was late, infections were more troublesome. The golden opportunity is said to be the first six hours post-trauma. Wounds treated within this limit are said to be in contamination phase; those treated thereafter are in the infection phase. Basic elements in the treatment of wounds are as follows:

(1) The time element—within six hours post-trauma.

(2) The cleansing element, such as soap and water, augmented by the addition of more soap and more water until the parts are cleansed, as in the pre-operative cleansing of the hands.

(3) The excising element, commonly spoken of as débridement. This means the removal of all damaged tissue by nonscarifying incision until the following three criteria are attained: *(a)* the part looks healthy, *(b)* the edges of the excised wound present bleeding, and *(c)* there is muscle contraction if the wound is within the limits of muscle. The process does not stop at any limit short of the accomplishment of these three objectives.

(4) The hemostatic element. The wound should be left dry as far as hemostasis is concerned, for the reason that much oozing, plus serum, plus macerated tissue, plus body temperature, becomes an excellent autogenous culture medium, within which bacteria will grow easily.

(5) The sterilizing element. From this viewpoint various forms of the sulfonamides, preferably sulfanilamide, are much used. As to amount, the wound should be well coated with this drug. Too much applied is far safer than insufficient amount. This is quite universally accepted in this phase of wound therapy both in and out of military medicine.

(6) The suture element. If the wound is lacerated, and many of them are, the thought of suturing should be abandoned, that is, immediate suturing, but primo-secondary suturing is recommended. By this it is meant that the operator should place the sutures but not tie them until approximately the third day, depending upon the course of the wound. Primo-secondary suturing in war surgery is recommended as the best treatment of ordinary wounds from any source. In very deep wounds that are very ragged no suture of any type is recommended.

(7) The dressing element. Heavy gauze and hot applications are much used. Heavy gauze is stressed because it supports the part and promotes rest and immobilization, which are so vitally important. If joints are involved in the wound, additional immobilization is suggested to give further support in the way of splint. After the dressing is applied, the part is elevated or tilted in order to promote drainage.

(8) The aftercare element. Sulfanilamide by mouth is suggested. At Pearl Harbor 15 grains of sulfanilamide was administered every four hours and continued for three consecutive days post-operatively. No redressing was done until the third day, unless there were some special indications.

All dressings must be done with the greatest care to avoid re-infection. Sterile instruments and clean hands are necessary in order that infection is not carried to the wound or wound dressing. With the usual dressing tray there is a sterile clamp, thumb forceps; other special instruments are used when indicated. For the ordinary wound where there are abrasions and scratches of the skin-deep variety, the time element, too, is recognized, also the soap and water cleansing element, and the area is powdered with sulfanilamide. The treatment of this type of wound does, however, differ as far as the suturing is concerned in that immediate suturing is permitted; if the wound is in the stage of contamination and sutures are used, they should not be drawn too tight, they should not be too numerous, and drains should be used. Many times an improvised drain is necessary, such as rubber bands or pipe cleaners. The removal of drains within forty-eight hours is recommended in this type of wound. In this superficial type of wound, if the time limit is within the infection stage, and if much débridement is

*Delivered before the Sixteenth Annual Meeting of the American College of Osteopathic Surgeons, Philadelphia, October 27, 1943.

required, primo-secondary suturing is best. With this technic the alignment of skin edges is usually very satisfactory and cosmetic results are good.

THE INFECTED WOUND

The wound that has not been attended within the six hour posttraumatic limit, or the wound in which the pus-producing organisms are active, is considered to be infected. The typical signs and symptoms, such as pain, redness, swelling, loss of function, tenderness and systemic toxemia exist. The bacteria associated with this type of wound are mostly of the staphylococcus-streptococcus group. Less frequent are the invaders of the gas gangrenous type. For the usual wound infection, including cellulitis, the treatment is as follows:

(1) Provide exit for retained secretion by removing sutures, if present.

(2) Apply wet dressings of 3 per cent sulfanilamide in sterile water. Maintain this moisture by attaching to its reservoir, and keep the solution physiologically hot by electric bulbs or other electrical means in order to maintain even heat.

(3) When localization occurs, incision is indicated if and when there is *(a)* fluctuation, *(b)* induration, *(c)* pain. It is decidedly important that the incision be long enough and deep enough to provide self-gaping of the edges.

Drainage is indicated only if there is free bleeding or for the purpose of separation of the edges of the wound. The gauze to be used for this purpose is treated with 3 per cent sulfanilamide in mineral oil. In placing the gauze, gentleness is to be used so as not to traumatize further the already present wound and it should not be packed too firmly, which would cause it to drain and defeat the purpose for which it is intended.

Moorhead says: "Do not incise alone for any symptom, such as brawny induration, redness, red streaks, or adenitis, for if we do incise for these indications we may increase and not decrease the process, and what is more we may produce a blood stream infection by our efforts."

(4) Sulfanilamide is given by mouth, 15 grains every four hours for three days. The technique in the treatment of gas gangrene at Pearl Harbor was as follows: Liberal débridement, repeated x-ray exposure, sulfanilamide in the wound, sulfanilamide by mouth. Serum was used in only a few cases, and it is stated that all war wounds so treated recovered without re-amputation, and in every case of this infection sutures had been used.

Tetanus.—This yields usually to serum. In these cases débridement is also used and sulfanilamide employed locally and orally. The dominating factor in the treatment of all of these infections is blood transfusion. In reviewing the literature on war surgery, we now find described such internal medication as penicillin and gramicidin, still not accepted in war medicine to replace sulfanilamide, although in the future this may come to pass.

TREATMENT AT FORWARD UNITS

The following is the routine procedure in the care of the wounded at the First-Aid post before transferring to the surgical center:

(1) Simple dressing is applied to the wound, which varies according to the indications.

(2) 3000 units of anti-tetanus serum are given. Anti-gas gangrene serum at this stage may be of value, but a decision as to its general use has not yet been arrived at. Sulfanilamide may be administered orally to the more seriously wounded, especially in cases where fractures are present. Two grams are given by mouth to start with and 1 gram at four hour intervals (total amount limited to 20 grams), and all of the medication given is noted upon the field medical card for future guidance.

(3) Shock: The first needs of the wounded are rest, warmth, relief from pain, and drinks. These elements of first need are carried out as far as circumstances will permit, although they cannot always be accomplished under conditions of activity. When achieved they go far toward bringing a man out of primary shock.

It is recommended, when possible, that a transfusion of a pint of serum or plasma at this stage be given in serious fracture cases or in those in which a severe hemorrhage has been controlled by ligature.

Fixation of Fractures.—At the forward units this, of course, is emergency treatment. The purpose is to obtain satisfactory fixation. This will prevent many complications, such as wound shock and increased local tissue damage. In fractures of the thigh and knee, the Thomas splint is of greatest value. This is applied over the clothing with the boots and socks still in place. Moderate traction is applied to the boot. The attempt is not to reduce the fracture completely, but to prevent complications. The tension applied is intended only to stabilize the fragments.

Fractures of the tibia and fibula are also treated by the use of the Thomas splint, but as a rule little or no traction is required. The object is to control the rotation of the lower fragment, which is accomplished by binding the foot to the footpiece of the splint. In fractures of the lower half of the leg, a simple fracture box is recommended. This, of course, also must have a footpiece to which the foot is bound for the same purpose of correction of rotation.

Fractures of the proximal half of the humerus, including injuries to the scapula, are best fixed by binding the arm to the side with a pad in the axilla and the forearm supported by a sling. In fractures of the lower half of the humerus or at the elbow joint, a posterior angular splint is used, extending from the shoulder to the hand, the elbow set at a right angle. Wire splints are valuable for this treatment because of their flexibility. Plaster of Paris is used when available, but it must be remembered that a circular plaster-of-Paris splint at the elbow must be applied with consideration of the circulation at that point. Fractures of the forearm and wrist are also immobilized on wire splints, with the forearm at right angles to the elbow.

Simple fractures, as a class, are treated in the same way under conditions of war as they would be in ordinary civilian life, recognizing the following procedures: first-aid protection, early reduction, and proper immobilization.

Compound fractures, with their pathological status as a result of war injury, differ from those

encountered in civilian life in several ways because of the greater comminution that is present resulting from projectiles. With rifle and machine gun bullets damage and contamination of the soft parts may be minimal, but the wounds resulting from bomb and shell fragments are often damaged to the extreme. War wounds are also complicated by problems of transportation in the emergency and delay in treatment, also in the emergencies there is interruption of treatment. The operative treatment of the compound fracture should be applied, of course, at the earliest possible moment. There are involved in this type of injury broken bones, usually multiple, and also soft tissue, muscle and fascia. Much of this is damaged beyond repair. This dead and dying tissue furnishes ideal conditions for the growth and activity of contaminating pathogenic organism. It is removed by careful dissection and irrigation. This is done with the greatest care in order to prevent the spread of infection to deeper planes. Complete anesthesia is the rule, while the fractured bone is set in maintained traction. The wound and the surrounding skin are thoroughly scrubbed with soap and water. The injured part is then draped and the excision of traumatized tissue and foreign bodies is carried out by sharp dissection. This is done in layers with frequent changes of instruments and at the same time the wound is in constant irrigation with warm physiological saline solution. Four quarts is the minimal amount. During the irrigation the deeper planes of tissue and sides of the wound are retracted, and the nozzle of the irrigating instrument is so applied that the direction of the flow is from within outward. The substances removed from the wound are placed in a sterile container for aerobic and anaerobic cultures to establish the character of the contaminating organism. At the completion of the débridement, salt solutions from the depths and extremities of the wounds should be cultured in order to test the efficiency of the operation. The result of these cultures will be to help in deciding on the future treatment of the wound.

The next step in the treatment is that of the alignment of the fractured bone and the application of the dressing to the wound. The sulfa drugs are here used in all of the planes and crevices of the wound, and the surfaces are separated by vaseline gauze. It is recommended that these wounds be not immediately closed. Some surgeons recommend the primary closure and many report success, but when there is a failure in this type of treatment the result is usually a calamity. Whether the sulfa drugs or zinc peroxide is the most efficacious for local use is still a matter of debate, the result of which will be established by further experience. The immobilization of the fractured bone is carried out by traction, suspension, circular plaster-of-Paris splint, either alone or with wire. Placement screws, plates, pins, etc., find their uses, the details of which are the same as in civilian surgery.

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Shock*

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In view of the general confusion existing in the minds of most physicians concerning the differences and similarities in the clinical pictures presented by shock when caused on the one hand by wounds, burns, intestinal obstruction, anaphylaxis, etc., and on the other hand by uncomplicated hemorrhage, the purpose of this paper will be to review the basic pathology of shock and to give briefly the treatment. I hope to cover the dynamics of shock in the light of our present-day knowledge concerning fluid balance.

There probably has been more effort expended toward understanding this clinical syndrome and more confusion in interpretations of laboratory investigation than in any other condition.

Our clinicians and surgeons are too well aware of shock symptoms, and of its death-dealing qualities, but their efforts have but slowly added anything substantial in treatment, except prevention. With the advances in biochemical research and new developments in technic in venoclysis and suitable solutions for the same, much confusion has been eliminated. Procedures for early diagnosis of shock which are suitable, yet not beyond the laboratory ability of any intern or physician, have done much to reduce the mortality rate.

In order to show the logic of treatment and to emphasize the importance of early diagnosis, we shall first discuss the physiology of the capillaries.

*Delivered before the annual meeting of the Michigan Association of Osteopathic Physicians and Surgeons, Grand Rapids, Mich., October 28, 1943.

These small blood vessels are made up of a single layer of endothelial cells, which have the capacity of tonus and of contractility, and are permeable to all fluid portions of the blood except plasma proteins. They act as diffusion membranes and respond very delicately to their oxygen supply, metabolites and certain irritants (viz., histamine, venoms, bile salts, bacterial toxins, tissue extracts, hydrolytic products of proteins, etc.). Krogh[1] showed that capillaries are such finely drawn tubes that one cubic centimeter of blood is in contact with from 5000 to 7000 sq. cm. of endothelial surface. If one can imagine 16 drops of blood spread over a surface of from 5 to 7 square feet, he may sense the completeness with which a minimum quantity of blood is exposed to a maximum area of diffusion surface.

Normally the capillary network of a tissue or organ is contracted and practically empty while that tissue or organ is at rest. When a physiological demand is made, the cells responding produce or liberate a cytoplasmic substance which causes the capillaries adjacent to them to relax and dilate, thus allowing an inflow of arteriole blood, bringing with it oxygen and nutrient materials to supply the cells of that area, so that they may carry on their function. The oxygen and a hormonal substance, probably from the pituitary gland, cause the capillaries to contract down to a caliber sufficient to meet the physiological demand made on the tissue or organ. In such a delicate yet efficient mechanism there is no excess supply or unfilled demand present under normal conditions.

It is important to realize that if all the capillary structures of the skeletal muscles were to be dilated simultaneously, approximately the total blood volume would be required to fill them. Other areas such as the pulmonary structures, gastrointestinal tract and the parenchymatous organs have a capillary volume perhaps of equal magnitude. The disparity of blood value and volume capacity of the vascular system which would occur if these areas were simultaneously dilated give a general picture of the circulation in fatal shock.

The smallest manifestation of shock is the "wheal" produced by the injection of an irritant into the skin. First the hyperemia or redness occurs; this is similar to functional and inflammatory hyperemia. However, there soon follows the blanched center and pseudopodia which is the result of escaping fluid from the capillaries or edema. The capillaries in this confined area are permeable not only to the crystalloids and water, but also to the colloids or plasma proteins. This is "minute shock" as described by some investigators. The endothelium has ceased to be a diffusion membrane in the above described lesion.

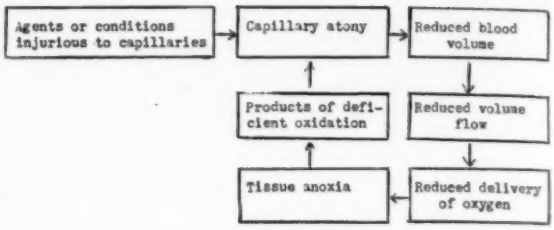
As the fluid and protein loss continues, the blood becomes concentrated with its cellular content; thus the viscosity is increased. The capillaries are literally and actually packed with erythrocytes. The anoxia thus produced by decreased circulation further relaxes the capillaries and a vicious cycle is established. The venules lose their tone and dilate, the venous pressure is reduced and the return to the heart is diminished. Thus the cardiac output is reduced and the anoxia progresses.

As this "cycle of death" is beginning the sympathico-adrenal system is stimulated, probably through the carotid sinus, and there is a generalized vasoconstriction of the arterioles in an effort to maintain circulation to the vital organs; thus the pallor of the skin, perspiration, and decreased temperature.

Tachycardia, increased arterial pressure, increased blood sugar, and dilatation of the pupils are also present in the early stages of shock. As this process continues evidence of circulatory failure presents itself. This comes from a break in compensation because of anoxia, with resultant capillary permeability and fluid loss.

In the normal physiological state the fluid content of the blood, with the exception of its colloids, are being continuously forced through the endothelium of the capillaries as the result of hydrostatic pressure produced by the heart and arteriole tone on that side of the circulatory system. The osmotic tension exerted by the colloids plus the hydrostatic pressure of the extravascular fluids is less than that exerted by the pumping force of cardiac contraction, hence fluid passes out of the vascular system. However, on the venous side of the circulation, the venules, the hydrostatic pressure is reduced or lost in the capillary system and the osmotic tension in the vascular system exceeds that of the extravascular fluid and diffusion into the vascular system occurs and the blood volume is maintained.

In shock this situation is changed, since colloids as well as crystalloids and water pass through the endothelium and the osmotic tension of the blood stream is lost. In order to have osmotic tension, it is necessary to have some molecules or ions nondiffusable.



A VICIOUS CYCLE

Damage to endothelium causes a sequence of circulatory disturbances resulting in tissue anoxia. Lack of oxygen causes atony of capillaries. This introduces a self-perpetuating quality into the mechanism, giving it the character of a vicious cycle.—(Adapted from Moon[3])

Otherwise equalization of pressure is immediate with no increased fluid content or molecular content on either side of the membrane.

The fluid imbalance present exerts an influence on the tissue cells themselves since their surfaces act as diffusion membranes normally. The increased protein content of the extracellular and extravascular fluid causes catabolism and cellular activity changes accordingly. The increased extravascular intercellular fluids cause increased lymph flow through the right lymphatic and thoracic ducts. This lymph has an increased protein content and some erythrocytes.

The departures from physiological constants accompanying the syndrome of shock are: reduced total and effective blood volume, a reduced minute volume cardiac output and volume flow of arterial blood; hemoconcentration, increased nonprotein nitrogen, glucose and potassium content of the blood; reduced metabolism, alkaline reserve, chloride and oxygen content, delayed coagulability of the blood, and signs of disturbed renal function.

Hemoconcentration is beyond a doubt the most constant, reliable and early, yet easily detected evidence of shock. This merely requires securing a small quantity of blood for erythrocyte count, hemoglobin determination, and specific gravity findings. The hemoconcentration will be present from minutes to hours and even to days before other circulatory deficiency manifests itself. This immediately rules out hemorrhage, as hemodilution accompanies this condition. The plasma loss accounts for this pathological variance which may give an erythrocyte count from 6,000,000 to 9,000,000 and hemoglobin concentration in proportion. If for no other reason than the foregoing, the importance of accurate blood determination prior to surgical procedures, difficult obstetrical manipulations, in the course of severe medical diseases and following injuries is self evident.

The pathological changes incident to shock are endothelial permeability, disturbance of fluid balance, edema of soft tissue, serious effusions, increased flow of lymph, hemoconcentration, capillovenous congestion, stasis, petechial hemorrhages. The electrolyte balance, intra- and extracellular, is disturbed and the tissue cell which normally functions as an osmotic unit no longer functions as such. This probably accounts for hyperpotassemia which Scudder[2] suggests may account for cellular injury. However, other investigators have demonstrated that hemoconcentration regularly precedes increased potassium content of the plasma and interstitial fluid.

Few disease processes produce a more typical clinical picture, more significant pathologic findings, and more characteristic visceral changes than shock. They are the distinctive clinical and pathologic features of circulatory failure of capillary origin. It may develop not only after traumatic injuries, surgical procedures or extensive burns, but also incident to abdominal emergencies, intoxications, severe infections or serum disease, and in acute poisonings of diverse kinds. The same syndrome may be produced experimentally by trauma, intestinal manipulation, burns or anaphylaxis, or by the injection of various capillary poisons.

The usual procedure of classifying shock into primary and secondary will be adhered to because of differences in dynamics and treatment.

Primary shock is frequently spoken of as neurogenic shock. It occurs immediately on injury, fright, pain, grief, sight of blood or mangled wounds and its mechanism of production is similar to syncope. It is usually of transitory nature, but may merge into true shock or secondary shock. There is no fluid unbalance or characteristic blood change to identify it. It frequently accompanies abdominal emergencies, i.e., acute pancreatitis, perforations, wounds, mesenteric thrombosis or sudden strangulation of a loop of bowel. The stimulation of mesenteric and peritoneal nerves may excite vasomotor reflexes which result in primary shock.

This type of shock is amenable to treatment with vasoconstrictor drugs, stimulants, shock position with head lowered, rest, maintenance of body temperature, etc. Blood pressure is not lowered and pulse rate is increased, may be thready due to marked vasoconstriction and decreased peripheral circulation. Sympathico-adrenal response produces pallor, moist skin, dilated pupils, rapid thready pulse and rise in blood pressure.

Further manipulation, anesthetics and continuation of shock-producing procedures are contraindicated. Surgeons recognize the error of continuing shock-producing procedures when primary shock is present and allow patients to react before further treatment is undertaken. Vigilance must be the "watch word," as primary shock may merge into secondary shock which is death-dealing.

True shock or secondary shock begins similarly to primary shock with increased pulse rate and transitory rise in blood pressure. Those who wait for a drop in blood pressure before instituting treatment are merely waiting for departing opportunity, for it means a break in compensation of the sympathico-adrenal system and actual failing peripheral circulation. Long before this fall in blood pressure occurs, the blood diagnostic signs have appeared, particularly hemoconcentration. Some observers state that usually two to four hours elapse from the time of injury until secondary shock becomes manifest.

In war injuries, contributing factors of cold, fatigue, exhaustion, hunger, etc., may shorten this interval. Hemorrhage is a factor which markedly aggravates secondary shock, because of the fluid unbalance produced by shock plus the additional fluid loss by hemorrhage. The wounded withstand anesthetics and respond to surgical treatment much better if given supportive treatment of fluids, warmth, stimulants and rest, prior to wound care. Shock victims are very sensitive to narcosis and slight losses in blood.

Absorption of devitalized or injured tissue substance has become a problem in those wounded in air raids. Victims who have been pinned under debris with very mild superficial evidence of injury succumb many times in spite of treatment, from irreversible shock.

Tourniquets are left on mangled limbs that require amputation, until the surgeon is ready to remove the part, because the absorption of substances from injured tissue produces shock.

In the prevention and treatment of shock the first six hours following injury are the "golden hours." Low arterial pressure is not incipient shock, but on the other hand is evidence of decompensation. The length of time that the sympathico-adrenal system can compensate for the decreasing blood volume is not unlimited. The time will be short until capillary relaxation leads to stasis and to irreversible changes.

Shock has been treated symptomatically for years without satisfactory results. The use of epinephrine for declining blood pressure and digitalis for failing circulation and to improve cardiac action is obsolete. To treat shock by such means is to have naive confidence in the omnipotence of drugs. Inasmuch as vasoconstriction is part of the compensatory measure produced by the sympathico-adrenal system, further administration of epinephrine parenterally certainly can not produce action beyond physiological efficiency of this system and perhaps may even produce further evidence of shock. Some reports on repeated injections of epinephrine in serum sickness, transfusion shock and urticaria with fatal outcome may be explained on the basis of shock initiated and maintained by adrenalin.

The use of neosynephrin to counteract the reduced blood pressure in spinal anesthesia is not of the same mechanism, but may contribute to it later.

Narcotics should be used to relieve pain, fright and apprehension but beyond this point they are dangerous, as respiratory depression reduces oxygen intake and may contribute to shock.

Stimulants such as strychnine and caffeine are not heralded as being beneficial in overcoming capillary permeability or improving cardiac respiratory depression accompanying irreversible shock.

Mechanical measures, such as bandaging extremities, elevating foot of bed, and sandbags are not entirely rational inasmuch as the stasis is capillary and not venous and gravity and pressure does not seem to influence capillary congestion unless applied with such pressure as to inhibit arterial circulation.

Trendelenburg position is beneficial in syncope and primary shock. The pulmonary stasis and congestion which are a feature of true shock certainly would not be benefited by the lowering of the head of the patient.

Oxygen has a very prominent role in shock prevention and treatment. It is the accumulation of incompletely oxidized products plus absence of oxygen in tissues and capillaries which keeps the shock cycle operative. It is given in concentrations from 93 to 100 per cent with or without carbon dioxide.

The use of adrenal cortex hormore (cortin) in prevention as well as treatment of shock has been well substantiated clinically and experimentally, its function being to restore and maintain semi-permeability to capillaries and cell membranes. Thus it establishes and helps to maintain fluid and electrolyte balance. Clinical features present in adrenal cortex deficiencies are similar in many respects to those of shock. Therefore in burns, toxemias accompanying infections, and traumatic injuries, adrenal cortex is rational therapy. It may be given intravenously or intramuscularly. Desoxycorticosterone acetate in oil solution has been advocated for treatment of shock. There is some controversy relative to its efficiency as compared with natural adrenal cortex hormone. It is used in 5 to 10 mg. doses every 4 to 6 hours.

Replacement of fluids is the most potent factor in treating and preventing shock. The choice of fluid for replacement is that which has been lost. Transfusion of blood is not effective unless blood loss is present as by hemorrhage. Plasma, serum and human serum albumen in either isotonic or concentrated form is the fluid of choice for replacement. In frank secondary shock concentrated plasma given rapidly and in sufficient quantity to maintain circulation is to be recommended. This may be given intravenously or into the bone marrow sinuses, i.e., sternum or tibia of infants and young children. The initial dose in shock without hemorrhage is usually 35 to 36 gm. of protein equivalent to 500 cc. of isotonic plasma or 2 units. This is repeated as often as is necessary to maintain satisfactory quality of the pulse, blood pressure and blood concentration. Patients suffering from severe burns require more protein replacement than do post-surgical and traumatic shock cases. Records show many instances of huge doses, i.e., 600 cc. or 4 times normal plasma in severe shock and 1200 cc. to a severely burned patient. One case in which two-thirds of the body surface was burned received 700 gm. of dried plasma equivalent to 10,000 cc. of isotonic plasma; recovery followed.

Harkins[4] says that in burn shock particularly, 100 cc. of isotonic plasma should be given for each point the hematocrit reading exceeds 45, as long as the proteins are above 6 mg. per 100 cc. If the hematocrit reading is 50, the patient should receive 500 cc. of isotonic plasma or 125 cc. of 4 times concentrated plasma.

Such fluids as acacia, pectin or purified gelatine should be used only in emergency where plasma, serum or blood are not available. Other fluids are still in the experimental stage except serum albumen, which is manufactured for the armed forces and is not available for civilian consumption.

On an average one gm. of serum albumen is capable of withdrawing from surrounding tissues into the blood stream 18 cc. of water. Of the proteins of the plasma, albumen makes up 62 per cent of the total and is responsible for 85 per cent of the total osmotic pressure of the plasma. Its greater osmotic pressure is due to the size of its molecule as compared with those of fibrinogen and globulin which are larger. Its greater osmotic pressure property permits the use of a 100 cc. solution 25 per cent concentration, which is approximately the osmotic equivalent of 500 cc. of citrated plasma.

The factor of transportation and volume necessary for therapeutic measures makes it ideal for the armed forces.

SUMMARY

1. Shock is characterized by hemoconcentration, which is an early manifestation, and detectable by simple blood examination.

2. Disparity between blood volume and volume capacity of the vascular system is constant in true shock.

3. Oxygen, adrenal cortex and replacement fluids are essential measures in treating shock. The replacement fluid should be that which has been lost through the injured capillaries. Blood plasma, either isotonic or concentrated, serum or serum albumen are the fluids of choice in combating shock.

Note: The author claims nothing original in this discussion. If this presentation has helped to make the syndrome of shock more understandable its purpose is fulfilled.

18600 Schoolcraft

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SCIENTIFIC RESEARCH AND CLINICAL TEACHING

That scientific research should be supported is obvious if we are to progress; but the acclaim it has received in the past has led some medical educators to regard a medical school as a place to do research work and to train scientists, whereas, it exists primarily to train students for the practice of medicine . . . To illustrate the emphasis or overemphasis that has come to be placed on research in the present-day training of a doctor, let me say that a young man who may have finished two or three years of hospital work and who desires to continue his clinical training, will find no financial support except the pittance as a hospital resident, but let him have a problem however remote from practical medicine, so long as it smacks of science, and he will find several foundations willing to aid him . . .

Such wrongs are often righted by time, and already there are signs in the offing that the reformation movement has reached its peak and the pendulum is gradually swinging back. Accelerating this trend will be the adjustments made necessary by the war and not the least of these will be a financial one.—Roy W. Scott, M.D., *Jour. Assn. Am. Med. Colleges*, 1943 (Nov.) 18:359.

A Review of the Literature on the Management of Head and Neck Injuries in Wartime*

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The injury of the head and neck is common in both active combat and in civilian life during air raids. Therefore, I have reviewed the subject matter from both angles, as I have had no actual experience as a military surgeon.

The aim of surgery is conservation of function, and the war surgeon is called upon to produce this result as quickly as possible. His problem is to repair the wounded so that they may return to duty. Therefore, some of the procedures following may not be the orthodox routine of civilian life.

The efficiency of each human unit engaged in the war depends more upon his cerebral efficiency than on any other single factor.

Today, in the big industrial centers, we are preparing for what is the popular sport of the enemy —the bombing of plants and civilian abodes. We are confronted with the task of training ourselves to handle large numbers of injured persons in the shortest possible time. Many hands are needed, and the young doctor just out of school is as valuable as the more experienced practitioner, and he should be encouraged to study and prepare for any emergency.

Injuries of the brain and its envelopes, the skull and scalp, are common.

It should be appreciated that, while operative surgery is of great importance in brain injuries during an air raid, it is but an incident in general management, and a large proportion of closed injuries come within this scope.

Physical violence and pathogenic bacteria are the common injurious agents in head injuries.

MODES OF TRAUMA OF THE BRAIN

The brain may be injured within the intact scalp and skull or with a wound or fracture of these envelopes. The kind of force applied, whether at high of low velocity, whether by a light or heavy mass, whether the line of force is perpendicular or tangential to the skull surface at the site of impact, the shape and size of the object determines the nature of the injury.

The damage to the brain varies from temporary suspension of function without obvious anatomical change (concussional injury) to disintegration of its substance. In all injuries, hemorrhage plays a major role.

Local Percussional Violence.—This occurs when an object or bullet strikes the skull at a tangent, bends it inwardly momentarily and it springs out again. This does not produce a fracture but a concussion with loss of function, either mono- or hemiplegia, lasting for a few minutes to hours; severe hemorrhage may occur from rupture of the vessels, extradural, subarachnoid or intercerebral, and the patient may still retain consciousness.

Violence by Momentum.—The alteration of momentum of the entire head, be it struck by a small mass at a high velocity or a blunt heavy object at low velocity, also the abrupt arrest of the moving head in a fall to the ground is of equal significance. Such abrupt movement or arrest of the head may cause widespread concussion, hemorrhage or even laceration of the brain.

Violence by Penetrating Missile.—The extent of injury depends upon the size, shape and velocity of the object coming in contact with the head. The velocity is most important, as a small missile at high velocity produces great damage along its track and also considerable hemorrhage which aggravates and extends the damage. A bayonet injury may also cause a similar wound.

Massive Intracranial Hemorrhage. — Massive hemorrhage is of such volume that it encroaches on the intracranial space and causes a serious rise in intracranial pressure.

The blood may extravasate (1) intracerebrally, (2) extradurally, and (3) subdurally. Treatment is evacuation of the clot.

Chronic subdural hematoma occurs weeks after injury, clot is organized and then liquifies. There are symptoms of tumor. Treatment is to drill a hole, irrigate, and drain; if oozing continues, it is necessary to open and remove the sac.

FRACTURES OF THE SKULL

Simple fractures are not of great importance, but may become so when the broken bone causes damage to an important structure through the brain; such complications rarely call for direct treatment.

Compound fractures are important because bone may become infected. Fracture may cause wounds into the nose and sinuses and aural cavities. Fractures of the base of the skull are often free of infection. If compound fracture of the vault of the skull all loose, devitalized bone must be removed. It is easy to graft bone, but infection may be fatal.

EVALUATION OF PATIENT

The patient injured in the head should receive a careful examination, at which time the following points are considered:

(*a*) If a wound is present, is it bleeding? If so, bleeding should be stopped by pressure, hemostat or a tie suture; if bleeding comes from a deep structure, light packing may afford enough pressure to stop it.

*Delivered before the Sixteenth Annual Meeting of the American College of Osteopathic Surgeons, Philadelphia, October 27, 1943.

(*b*) Whether the patient is conscious or unconscious.

(*c*) The degree of shock; if severe, treatment is given at once.

(*d*) Number of head wounds, location of bruises and hematomas.

(*e*) Escape of blood or spinal fluid from nose, ears, mouth.

(*f*) Report of the medical team which evaluates the patient's other injuries and their effects on the head.

It should be remembered that a small scalp wound may be serious.

Following a careful survey of the external head injuries and treatment for hemorrhage and shock, the medical team continues with diagnostic procedures, as, pressure of spinal fluid, often a surface finding (general neurological), ventriculography, and x-ray of the skull, if necessary. Following this, if the patient requires formal brain exploration, a neurosurgeon should be consulted.

TREATMENT OF SCALP WOUNDS

All scalp wounds are classed as serious until otherwise proved. Scalp wounds, during war, furnish many surprises, especially if an x-ray examination is not available. Therefore, the practice of a simple stitching of the scalp should not be considered. Bleeding points should be taken care of and, later, the patient taken to the regular operating room where a careful inspection of the skull can be made, the wound edges carefully turned, and bleeding points coagulated. If a large portion of scalp must be removed, the enlarging of the wound into an S-shape will give better approximation. The dusting of sulfanilamide powder reduces the incidence of infection. A careful suturing of the scalp, with separate closure of the periosteum, is of great importance.

TREATMENT OF COMPOUND FRACTURE OF SKULL

Patients with compound fractures should be transferred to brain surgery as soon as their condition warrants. At this time, wide exposure of the skull should be carried out. A cruciate enlargement of an existing wound to deal with an underlying craniocerebral injury is not practical. The use of suction, diathermy to seal the vessels, and special illumination is essential. The use of sulfanilamide powder in surrounding tissue other than the brain is to be considered.

The scalp must cover the bone and brain which is exposed, and must be loosened if necessary.

DRESSINGS.

The dressing of head wounds is of great importance. The type of bandage used for the abdomen and extremities is unsuitable for the rounded head. Small tens and fives will not remain in place. Domette bandages, of open-woven muslin, slip and become loose. Cotton-wool sticks among the stubbly hairs on the scalp. The use of sterile vaseline keeps skin soft and makes dressing easy to remove. A large folded triangle of gauze, when applied, covers the entire head, and dressings are thus held in place. It can be applied rapidly and a gauze domette bandage can be applied following this.

INFECTIVE COMPLICATIONS OF WOUNDS OF THE HEAD

Two common complications are septic meningitis and thrombophlebitis of intracranial pressure. If a silent side, the only symptom is increased intracranial pressure. Ventriculography discloses a normal system; at time of puncture the fluid is in excess which is diagnostic; it is due to a subacute external hydrocephalus as a result of failure of absorption in the thrombosed sinuses.

Treatment.—Lumbar puncture daily for ten days. If this does not succeed, bilateral cranial decompression may be used in the temporal area until the fluid circulation re-establishes itself. (Chemotherapy is suggested in septic thrombosis.)

Cerebral Abscess.—Acute abscesses should be observed. It is suggested that chemotherapy with the use of sulfa drugs be instituted. In the event of constant intracranial pressure by lumbar puncture, when the temperature has receded and it has become subacute, and when the surgeon is sure that the walling off process is complete, decompression and puncture and exploration of the wound can be carried out, and a rubber catheter placed in the cavity. Intravenous injection of 50 cc. of 50 per cent sucrose solution will reduce the edema around the abscess.

A FEW HINTS IN GENERAL MANAGEMENT

In the case of the patient who remains *conscious:*

1. The patient with head injuries is more comfortable with the head low.

2. In the majority of postconcussional cases, fluid pressure is low and there is no reason to sit the patients up or restrict their fluids.

3. In a few cases where fluid pressure is high, lumbar puncture and fluid restriction is suggested.

4. Patients with uncomplicated concussion can sit up in from three to seven days, and be out of bed in another three to seven days.

5. Gentle exercise, at first, and, in six weeks, strenuous exercise can be prescribed.

6. Headache should be gone in four to six weeks. In long persisting headache, due to vessel injury, posttraumatic epilepsy may occur.

The patient who is *unconscious* after head injury:

1. He should be laid upon his side or in a half-prone position so that his airway remains open.

2. Fluids should be fed by stomach tube, liberally and regularly.

3. Bed-wetting is controlled by placing a piece of rubber tube over the penis in the male, strapped with adhesive, and a rubber bidette is used with the female.

4. The bowels should be irrigated every other day.

5. Pulse, respiration and temperature should be taken every hour.

6. The danger signs: (*a*) rapid elevation of temperature, above 103 F., (*b*) epileptic seizures; (*c*) restlessness and irritability, confusion, hallucinations.

EMERGENCY MANAGEMENT OF WOUNDS OF THE NECK

Wounds Involving the Great Vessels.—A puncture wound or any wound of such type that would cause leakage or gross hemorrhage of any of the great vessels of the neck is of major importance in considering relative mortality and first-aid requirements.

The life of the victim depends upon immediate and competent management. This combines to a certain extent both first-aid and subsequent handling.

Wounds of the great vessels are extremely serious due to the great loss of blood in a short time which produces profound and usually fatal states of shock before the hemorrhage can be controlled. Therefore, it is essential that these wounds be handled as efficiently as possible and as rapidly as possible if the victim is going to survive.

Pressure over the carotid vessels and in back of the clavicle over the subclavians on the same side as the wound is good, but in practice it is a difficult procedure to maintain until the victim is removed from site of action or catastrophe. It is also even more difficult to maintain pressure by hand while in transit to a receiving station.

It is suggested that the physician in the field or first-aid squad carry suture and needle for the purpose of making a suture loop through the overlying structure and passing behind the offending vessel and tying this loop externally. This procedure is appealing because it will produce and maintain for a reasonable length of time the stasis necessary to save the precious blood and allow the victim to be comfortably moved to the receiving station.

If it is not practical to suture as described above, it may be found practicable to merely suture the skin over the wound and the resultant hematoma will give sufficient pressure to arrest the severe hemorrhage which is so fatal. The hematoma may be removed at leisure and under more ideal conditions than can be found at the place where the wound occurred.

The treatment of these wounds at the receiving station or hospital is radical exposure of the involved area and for this exposure it is suggested that an incision be made or the wound itself be extended in line with the sternocleidomastoid muscle and slightly anterior to it. This exposure is very practical and with the victim under anesthesia the sternomastoid muscle should be sufficiently relaxed for its retraction if the vessel or vessels involved need attention in their course under it. With this exposure accomplished, ligation or repair of the damaged vessels may be readily accomplished. However, we should be cautioned by the constant possibility of precipitating a fresh hemorrhage from a vessel which may be perforated but not necessarily severed and the relaxation or removal of surrounding fascia stripping it of its support will possibly allow its breakdown.

Close cooperation and coordination between the operator and his assistant or assistants is essential in the successful culmination of this work.

Supportive measures combating shock are indicated in the management of these wounds at all times. Blood plasma and intravenous saline and glucose or Ringer's solution and glucose are definitely indicated when available to maintain the volume and quality of the circulation.

Wounds Involving the Nerves of the Neck.—Whenever it is noted on exposing a wound of the neck that any nerves have been injured, it is suggested that primary or secondary sutures be made in case of severance of any nerves and foreign bodies giving pressure be removed.

Management of the Larynx.—The management of the larynx is the same in war as in peace except for gas attack, when special decontamination is called for, though the gas mask has lessened this problem. However, the rule is still to keep the airway open. Puncture wounds of the larynx call for tracheotomy, the control of hemorrhage and, later, a plastic closure. Crushing injuries to the larynx also call for immediate tracheotomy and, later, repair of the laceration.

The following hints are valuable in the treatment of the injured larnyx: (*a*) early emergency tracheotomy; (*b*) remember Jackson's tracheotomic triangle; (*c*) remove the patient to the kitchen and start the tea kettle; (*d*) do not give morphine and atropine or similar narcotic; (*e*) after tracheotomy, be sure someone stays with the patient.

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PROCAINE INHIBITS ACTIVITY OF SULFATHIAZOLE

The inhibitory effect of procaine on the bacteriostatic activity of sulfathiazole is the subject of an experimental study reported by Daniel Casten, M.D., Julian J. Fried, M.D., and Frances A. Hallman, M.S., in *Surgery, Gynecology and Obstetrics,* June, 1943. The increasing use of the sulfonamide drugs in the treatment of traumatic wounds has aroused considerable speculation as to the mechanism of their action and the factors which influence their activity. Since the report of Jensen and his co-workers on the treatment of compound fractures, surgeons have recommended the topical application of one of the sulfonamide drugs in a variety of infected or potentially infected wounds.

Para-amino-benzoic acid has been found to inhibit the action of sulfathiazole against staphylococcus in vitro. Since procaine is a derivative of this drug and is also probably the most commonly used local anesthetic in the treatment of fractures and other traumatic and potentially infected wounds, the writers undertook to investigate the effect of procaine on sulfathiazole in vivo.

Rabbits were used in the experiments. The infecting organism used was a strain of *Staphylococcus aureus* from a case of acute osteomyelitis. Various procedures were carried out involving trauma, procaine infiltration, staphyloccic infection, and sulfathiazole administration.

Results show conclusively that procaine will inhibit the bacteriostatic activity of sulfathiazole in wounds inoculated at the time of trauma with a suspension of *Staphylococcus aureus.* As a result of these studies, the writers are of the opinion that the use of procaine for local anesthesia in the treatment of compound fractures and traumatic wounds is contraindicated when sulfathiazole is to be applied topically.

KATHERINE BECKER.

Journal A.O.A.
January, 1944

The Shoulder Joint: A Radiological Consideration*

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In considering the roentgen study of any part of the body, it may be well to emphasize that the success and thoroughness of such an examination presupposes:

1. That we know or study the anatomy of the part, both the soft tissues and the bones

2. That we employ proper technical factors necessary for making the best radiographs from a diagnostic point of view

3. That we get a thorough and complete history of the case

4. That we have cooperation of the patient

5. That we have the cooperation of the referring physician (we should be informed as to the blood count, biopsy, etc.)

6. That we proceed with our diagnostic study in an orderly manner.

When it comes to a knowledge of the anatomy of the shoulder, since many of our patients will be children, it is very important that we have a good idea as to the bone development at birth, the time of appearance of epiphyses, and the time of their fusion with each other and finally with the diaphysis.

Usually at birth there is no proximal epiphysis of the humerus, and the shaft is cone-shaped with the apex just slightly medial to the long axis of the shaft. The first epiphysis appears at from 4 to 8 months after birth and is medially placed; later it becomes the articular head. The lateral epiphysis, which later becomes the greater tuberosity, appears at from 1½ to 2½ years. About a year later a third nucleus in the region of the lesser tuberosity appears. It is rare to see all three nuclei on the same radiograph. About the fifth to sixth year both tuberosity nuclei fuse to form one epiphysis. This epiphysis unites with the "head" epiphysis at 12 to 14 years of age and fusion with the diaphysis takes place at about age 19 to 20.

Because of the undulating metaphyseal faces of the diaphysis, and epiphysis and the fact that all segments are superimposed one upon another, what appears to be the real epiphyseal line may have irregular transverse lines distal to it which lead to an erroneous diagnosis of fracture. One must be cautious in interpreting a radiograph of an infant as showing a case of true childbirth shoulder paralysis merely because the first nucleus to appear in the humeral head is lateral to the pointed extremity of the shaft instead of medial to it. One must be sure that the apparent lateral displacement of this first epiphyseal nucleus is not merely an error of projection because of a marked internal rotation of the whole arm.

If there is any question in making a diagnosis of any kind of epiphyseal fracture or neoplasm, it is well to ray the other shoulder in identically the same projection for the purpose of comparison.

*Delivered before a meeting of the American Osteopathic College of Radiology, Philadelphia, October 23, 1943.

At birth both processes and vertebral border of the scapula are cartilaginous. The nucleus for the caracoid process appears during the first year and soon becomes cap-shaped, fusing with the scapula at from the sixteenth to the eighteenth year.

The acromial process is formed from three to five nuclei about the fifteenth year or later and forms an irregular or separate line which may be mistaken for fracture. These nuclei soon unite with one another and fuse with the acromial diaphysis at about the twentieth to the twenty-fifth year. An independent osseous nucleus appears at the inferior angle of the scapula at the sixteenth to eighteenth year. About the same time the vertebral border epiphysis appears and both fuse after the twentieth year. During the adolescent period a nucleus appears in the lower part of the rim of the glenoid cavity and this, when fused, makes the adult cavity more concave.

A number of epiphyses may persist and form separate ossicles which frequently are suggestive of fracture.

The clavicle develops an epiphyseal nucleus at the sternal extremity from the fifteenth to twentieth year and union with the other portion of the bone takes place at from the twentieth to the twenty-fifth year.

As to dislocations of the shoulder joint, they are not difficult to diagnose and are usually anterior, posterior or inferior to the glenoid cavity. One must look for fracture when reporting a dislocation and insist upon a recheck after reduction, in order to be positive whether or not a fracture has resulted during the process of reduction.

Fracture of any one or more of the bones of the shoulder girdle, at times, may be very difficult to diagnose. This is true of a slightly impacted fracture of the surgical neck of the humerus because of no appreciable marginal change. Such fracture may split the head and greater tuberosity into several fragments. This may be true also of the clavicle, depending upon the plane of the fracture line. I once rayed a child three times before I could demonstrate a fracture which I felt positive was present. Fractures of the acromion are also readily missed. If one were able to take a true superoinferior or inferosuperior projection in addition to the routine views, what is sometimes a difficult case would be comparatively simple.

Fracture through the neck of the scapula and with some impaction may be readily overlooked. Other fractures of the scapula may be sub- or supraspinal and some involve the vertebral border or one of the angles. But one must be on his guard for a possible persistent epiphysis at the inferior angle.

About 90 per cent or more of the general run of my shoulder work has been composed of fractures, dislocations, osteoarthritis, bursitis, acute or chronic, or tendinitis calcarea.

The bursitis usually involves the subacromial or subdeltoid bursa and although the chronic cases may show calcareous changes and we usually refer to them as "calcified bursitis," a number of the surgeons who have operated on the shoulder report that the calcareous deposits are *without* and surrounding the bursa, rather than being *within* the bursa. Most of these cases respond to radiation therapy. Several of my patients who did not respond, showed the clinical symptoms due to cervical rib rather than bursitis.

Tendinitis calcarea usually involves the supraspinatus, infraspinatus, subclavius and the latissimus dorsi or pectoralis major muscles.

Osteoarthritic cases show various degrees of marginal productive changes, both of the osseous and of the soft parts, with erosion of the articular cartilage and a corresponding reduction in the joint space. The acromioclavicular articulation is most frequently involved. In rheumatoid arthritis there is a marked atrophy and rarefaction of the head of the humerus, also with erosion of articular cartilage, and sometimes there is ankylosis.

Osteochondritis usually occurs in children following trauma and results in a malacia which is very similar in appearance to that of the hip in Legg-Perthes disease. The epiphysis is compressed, denser at first, later probably rarefied with islands of dense bone within itself, producing a fragmented appearance. I would say there is mushrooming. Finally the articulation, after the epiphysis is healed, may take on the appearance of an arthritic joint.

Occasionally one may observe a case of hemophilic arthritis. McDonald and Lozner[1] of Boston, in the March, 1943, *American Journal of Roentgenology and Radium Therapy*, reported fifteen cases. There is a sharply defined area of articular necrosis with spurring of margins of the joint. Later there is evidence of subchondral cysts and capsular fibrosis with marked narrowing of the joint space. It must be differentiated from tuberculosis caries sicca. In the latter or dry tuberculosis, as it is sometimes called, the articular surface is ragged, shaggy and irregularly scalloped. One cannot make a positive diagnosis of a hemophilic joint without the demonstration of a prolonged venous coagulation time.

In renal rickets the metaphysis may be very thick and disorganized.

In Charcot's joint, there is a separation between the head of the humerus and the glenoid cavity, suggesting definite increase in the joint space. The head and the proximal shaft are eroded. There is amorphous calcium all about the joint which Brailsford[2] describes as a "collection of flucculent, calcified mush." The condition may be discovered incidentally as a result of a relatively painless dislocation or a spontaneous fracture from merely a slight trauma. At the acromioclavicular or the sternoclavicular articulation one is likely to make an erroneous diagnosis of malignant disease.

In children occasionally epiphyses show multiple osseous nuclei, a form of chondro-osteo-dystrophy.

In Albers-Schönberg disease the bones are increased in density but lack normal architecture, commonly called "chalky" bones.

Multiple cartilaginous exostoses of the familial type and osteochondromata may be found about the shoulder girdle.

I have not encountered osteomyelitis of the humerus in my experience.

NEOPLASMS

(A) Benign.—

1. Osteoma: This has a pedicle, is cauliflower-like in appearance but has a smooth edge with normal osseous structure. It may represent myxomatous or cartilaginous tissue according to Rigler.[3]

2. Simple Bone Cyst: This is the commonest benign lesion of the shoulder. There is an area of rarefaction representing the cystic destruction with a sharply demarcated edge. It shows no invasive evidence, but there is a slight expansion of the bone and definite thinning of the cortex. The condition is frequently discovered because of a pathological fracture.

3. Giant Cell Tumor: There is a soft tissue mass extending far beyond the periosteal limits with a zone of sclerotic bone extending around the tumor in an effort to encapsulate it. The cortex is preserved. The sharp demarcation from the normal portion of the bone and the extensive invasion of the soft tissues, aid in the differential diagnosis. According to Codman,[4] the tumor appears in the greater tuberosity, is limited by the epiphyseal line and does not invade the joint surface. Others claim that the appearance may depend somewhat upon the age of the patient, unilocular cystic in children and multilocular cystic in older patients.

4. Osteitis Fibrosa Cystica: This may be found in the shoulder as only "one" of the many sites as a result of a parathyroid tumor. There is a general osteoporosis of "most" of the bones of the body with formation of multiple cysts and kindred changes which present a very characteristic appearance. For this reason the bones in the other parts of the body must be examined radiologically in order to be sure of a correct diagnosis.

(B) Malignant.—

1. Osteogenic Sarcoma: Occurs in the proximal portion of the humerus or the sternal extremity of the clavicle. There is destruction of cortical bone and extension of the neoplasm into normal bone without sharp demarcation. It invades the soft tissues, is very destructive without any new bone formation and the appearance is that of a malignant tumor.

2. Multiple Myeloma: Appears in humerus or clavicle, is medullary, destroys bone in small rounded, punched-out areas, expands the cortex and is sharply demarcated early. It is multiple, both as to lesions and also as to bones attacked. It is a slow-growing tumor.

3. Endothelial Myeloma or Ewing's Sarcoma: It resembles a periosteal type of sarcoma and osteomyelitis. It is medullary and cortical. There is bone production parallel to the shaft of the bone as in osteomyelitis and transverse to the shaft with fine needles of bone as in sarcoma. But there is some bone destruction, too, and it invades the soft tissues. It is not sharply demarcated.

It destroys the cortex. It is single or multiple and of fairly rapid growth. It lays down numerous layers of bone like an onion skin. Metastases are early, rapid and extensive. It responds to irradiation much more rapidly than osteogenic sarcoma. Its ready response makes radiation therapy a diagnostic procedure sometimes. However, let me end by quoting from Paul C. Swenson's article in the September, 1943, *Journal of American Roentgenology and Radium Therapy:*

"Once the malignant nature of the disease was recognized, errors were made chiefly in considering the purely osteolytic lesions as probable metastatic carcinoma. One case was considered a lymphosarcoma because of the multiple osteolytic lesions associated with mediastinal adenopathy. A number of cases were considered osteogenic sarcoma, the diagnosis of Ewing's tumor being made after biopsy. Thus it is evident that although there will be suggestive roentgenographic and clinical differential features in some instances, biopsy will be the deciding factor in all.

"The efficacy of radiation therapy can be judged only from the cases of more recent years and then only in those in which we can be reasonably certain that the therapy judged by our present standards was adequate. One case, with the disease in the vertebral body, treated by irradiation alone, is alive and symptom free in the sixth year. Another was arrested for six years by irradiation alone only to succumb in the seventh year from pulmonary metastasis. A five-year period of observation is therefore too short to determine whether the disease has been eradicated. One patient is well thirty-two years following amputation of the involved extremity."[5]

325 N. Duke St.

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Radiation Therapy in Carcinoma of the Urinary Bladder*

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The purposes of this paper are (1) to describe the methods of treating carcinoma of the bladder, (2) to present an analysis of the radiation furnished by the use of radium and the roentgen rays and (3) to present results following radiation therapy.

Before undertaking the treatment of any bladder cancer, it should be classified as to form, size, location, histological structure, amount of infiltration and the presence or absence of metastases. This information may be obtained by rectal palpation, cystoscopic examination, a biopsy from the base of the growth and stereoscopic cystograms with the bladder inflated with air or sodium iodide. The general condition of the patient must be ascertained with special emphasis placed upon the cardiovascular and renal reserve.

A bladder carcinoma should never be treated with fulguration alone. The electric spark lacks power to destroy fully established cancer, and clinical evidence suggests that such irritating treatments stimulate the tumor to a more rapid growth.

Because of its anatomical position, the bladder is readily approached for treatment by either surgical or irradiation methods. Lesions of the bladder will remain confined to the organ for a long period and in malignancy, which is usually a squamous cell or transitional cell epithelioma or adenocarcinoma, the neoplasm is held within the bladder walls until a very advanced stage has been reached. Clinically, they are of three types: (1) Malignant papilloma, (2) papillary nodular carcinoma, and (3) ulcerative infiltrating carcinoma.

According to Ewing[1], the papilloma is the most common clinical type of tumor of the bladder. It is usually a villous growth with a narrow pedicle, or the papillae may be feathery. The growth may be flat or lobulated; it may have a broad, flat base, or it may be sessile. It is usually multiple and has a long course; some lasting as long as 18 years (Hodda) to 30 years (Guyon), and one case, 60 years (Fenwick). In many cases, the removal of the original tumor is followed by a recurrence at another site. This may be a new tumor or one arising from a preexisting lesion. Frisch saw recurrences in 21 out of 53 cases followed. Extension of the papilloma can occur through the wall of the bladder to the pelvic tissues, up the ureter to the kidney and along the pelvic lymphatics to the prevertebral lymph nodes. Metastases are not common but have occurred to the liver, lung, pleura, kidney, inguinal and axillary nodes.

The most important factor in the prognosis of carcinoma of the bladder is whether the tumor is papillary or infiltrating in nature, and whether it infiltrates an easily excised part, or an inaccessible region, especially near the trigone of the bladder.

The factors influencing the type of therapy are as follows:

(A) Size of tumor:

1. Small tumors, papillary or infiltrating, are best treated cystoscopically by radon seeds implanted.

2. Large tumors, if papillary, to be treated by suprapubic radium therapy.

3. Large tumors, if infiltrating, to be treated by radium through the open bladder and high voltage external radiation.

(B) Grade of tumors:

1. Lower grades of malignancy (1) and (2) to be treated as above outlined.

2. Higher grades of malignancy, particularly grade (4) to be treated, if possible, by external radiation and cystoscopically.

(C) Position of tumor:

1. When tumors are of the bladder base, which comprises 75 per cent of all bladder neoplasms, encroaching upon the ureters or internal urethra, irradiation is superior to operative removal.

(D) Condition of kidneys:

1. If the kidneys are infected, the ureters and

*Delivered before a meeting of the American Osteopathic College of Radiology, Philadelphia, October 23, 1943.

kidney pelvis dilated, then cystoscopic treatment by radium is superior to the open operation. The suprapubic operation and the massive implantation of radon seeds adds to the infection. The implantation of radon can be done in divided treatments. In 215 cases of bladder carcinoma treated by Barringer[2] 94 cases showed control of the cancer. In 121 cases, the cancer has resulted in death. Three year cures were 57 cases —31.7 per cent; five year cures were 50 cases—23.2 per cent.

In analyzing the indications and technic of the various forms of irradiation, I shall first review the cystoscopic implantation of nonremovable and removable radon seeds. The indications as summed up by Hyman[3] are:

1. In small circumscribed tumors, approximately 1.5 cm. in diameter, situated in accessible parts of the bladder

2. In small reoccurences after fulguration or operation.

3. When operation is contraindicated (advanced age, debilitated condition, general systemic condition, etc.).

High frequency transcystoscopic cauterization is of great value in removing the papillomatous projections or excrescences, this more definitely outlining the margins of the tumor as well as its base, facilitating the accurate placing of the seeds.

The fulguration should not be carried down to the base of the mass as it is important to leave some tissue in which to implant. The prime requisite for the proper implantation of radon seeds through the cystoscope is an implanting instrument of easy and reliable operation. The instrument must be flexible and provided with a sharp needle point. In addition, it must be easily loaded with the seeds and must permit the operator to have the tumor always in the field of vision. A "loading slot" flexible cystoscopic seed implanter is preferred as the instrument need not be removed from the cystoscope and can be loaded with a single seed at a time, thus preventing jamming or discharging the seeds into the bladder.

Radon seeds 1 mc. to 2.5 mc. each may be used in nonremovable implantation, but the employment of seeds containing 2.5 mc. is preferable because fewer seeds are required, thus increasing the accuracy and decreasing the number of punctures.

The seeds are of the composite type—filtered by 0.3 mm. of Pt. and buried to a depth of 1 cm., 1 cm. apart. The total dosage necessary for any one lesion must be based upon the amount of radiation that is required to affect, evenly, the entire base of the lesion as well as 1 cm. of tissue beyond the periphery, i.e., to the extent of approximately 6000 "r" gamma—the cancer lethal dose.

The implantation of removable seeds is carried out in similar manner, with radon seeds of 3 mc. contents with thread 2 cm. in length attached. These should be implanted 2 cm. apart. To deliver a dosage of 333 mc. hrs. gamma radiation from each implanted seed, each seed should remain in site for a period of 10 days. The seed may be allowed to remain in the tumor for a period in excess of 10 days, if for any reason it is deemed advisable not to cystoscope the patient at the end of the tenth day. The amount of radon remaining in a seed at the conclusion of 10 days is 0.5 mc. and the radiation dosage that this amount can deliver is negligible. The removal of the seed is carried out through the cystoscope using plain cystoscopic rongeur forceps.

For inaccessible, inoperable types of cancer and following surgical resection, high voltage x-ray therapy gives the greatest alleviation and the best 5 year results, and with Coutard's technic as shown by Ferguson[4], even higher 5 year results will be obtained. The factors of his technic were: 200 K. V.—0.5 mm. copper—1 mm. aluminum filter—70 cm. distance; 400 "r" were given daily to one of four skin ports directed toward the tumor, a total of 1200 to 1500 "r" were given each port.

Wirth[5] reported treatment of 10 cases in 1935 and 18 cases in 1938 of advanced carcinoma of the urinary bladder with super-voltage therapy alone. These cases were too advanced for resection or implantation of gold seeds and were verified by histological examination. Six of the original 10 cases were alive and free from disease from 2 years and 9 months to 3 years and 3 months. Of the new series, 8 cases showed apparently complete primary regression of disease from 10 to 26 months. Ten are dead: one from intercurrent disease and 9 with residual disease. Of the 18 cases, 17 were advanced infiltrating carcinoma while one was an extensive papillary carcinoma involving almost the entire wall of the bladder, but which had not been perforated.

The treatment factors were 800 k.v.p.—10 ma., with a filter of 3 mm. brass, plus 1 cm. of water (inherent filter) plus 3.7 mm. of lead in addition to a secondary filter of an ionization chamber containing 2 mm. aluminum, and 1 mm. al. and 3 mm. of celluloid in the diaphragm support. The patient is placed 10 cm. from the limiting diaphragm; a target skin distance of 70 cm. is used and treatment given with an intensity of 60 "equivalent r" per minute.

The total treatment time in days varied from 25 for those in whom treatment was not complete, to 63; the average time being between 35 and 45 days. It is believed a patient cannot tolerate sufficient dosage to obliterate carcinoma of the bladder in less than 30 days.

The major portal of entry of the roentgen ray beam is usually the center anterior pelvis. This is invariably given over the suprapubic region to a 12 cm. circular area. The next most frequently used portal is a 14 by 10 cm. area on both sides of the posterior pelvis, with the ray directed slightly medially toward the bladder. Occasionally a center posterior pelvic portal and a perineal portal are used to supplement the above three.

The plan of treatment has been 350 "r" to the single anterior pelvic portal and alternating this with 250 "r" to each of the two posterior pelvic portals. Approximately 14 treatments are given to each of these areas so that the center anterior pelvic portal receives 4900 "r" and each of the 2 posterior portals receives 3500 "r." These doses represent severe treatment and at least 60 per cent of these advanced cases are in poor general condition when therapy is started.

This form of super-voltage roentgen therapy has no place in the palliation of cancer of the bladder. It is more likely to cause a rapid decline of the patient's

general health and he has to be in fair general condition in order to stand this extensive treatment.

In addition to the well-known methods described of treating carcinoma of the bladder, Goin and Hoffman[6] have written comprehensively of a new addition to our armamentarium; the use of low voltage x-ray therapy at extremely short anode surface distances with the surface of the tube in contact with the lesion to be treated, after preliminary surgical exposure of the lesion has been carried out.

In those selected cases which are either so far advanced or so extensively infiltrated, that the usual procedures are of no avail, and in themselves result in high mortality, marsupialization of the bladder and intense radiation of the tumor in situ by the contact therapy method is proposed.

The technical factors employed are: 50 K. V. constant potential, 2 ma. of current, 22 mm. anode-surface distance, r afflux 1278 per minute. Irradiating a circular field 3 cm. in diameter the following depth doses were obtained:

at 1.0 cm.	32 per cent
2.0 cm.	13
3.0 cm.	6.4
4.0 cm.	3.6 of the surface dose.

Treatment is begun on the ninth or tenth postoperative day and the dosage used has been as high as 2,556 r per minute with an r afflux of 1278 per minute; 1 mm. Al. added filtration, half-value layer 1.0 mm. al. was employed. Treatment is given on alternate days, not including Sundays, and the total dose runs as high as 30, 672 r given over a period of 27 days.

No alarming sequelae and astonishingly mild radiation reaction, consisting only of injection and increased redness resulted.

From the small number of cases reported by Goin and Hoffman[6], and Goin, Crossan and Jellen[7], it is obvious that no definite clinical conclusions can be drawn, nor has sufficient time elapsed to permit any genuine evaluation of the method. In selected cases, however, a great deal can be offered to a patient with advanced bladder corcinoma in which fulguration or cystectomy would otherwise be used.

SUMMARY

The various methods and the technic of procedure in treatment of carcinoma of the urinary bladder have been given. Each method has its salient points and its adherents, but only with the close cooperation between the urologist, surgeon and the radiologist employing a combination of surgery, fulguration and irradiation, can there be offered to the patient the greatest hope of 5 year cures. The carcinoma register of the American Urological Association for 1934 reports that out of 349 reported cases 33.24 per cent were alive 5 years.

75 Lincoln Park.

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LET'S DO OUR PART NOW!

Osteopathic services and institutions are listed as essential to the health, safety and welfare of the nation.

The War Manpower Commission says explicitly of its new list of "critical occupations" that it does not replace the list of essential activities and occupations which has served as a guide to local Selective Service boards.

What is demanded now, to enable the osteopathic profession and its institutions most effectively to give their services in the interest of the health, safety and welfare of the nation?

A part of the answer is cash. And that cash must be spent now.

The tanks, ships and planes of yesterday are not strong enough or big enough or fast enough for today.

Osteopathic clinics, osteopathic laboratories, osteopathic faculties, osteopathic colleges of yesterday cannot meet the demands of today—still less those of tomorrow.

Cash must be spent today. Where does it come from?

From me, from you. From my friends. From your friends. From men and women who have learned what osteopathy is. From lay people whom you and I must tell what osteopathy offers for the health, safety and welfare of the nation.

How do we tell them? Trained men, capable men, are answering that question. They are answering it ably and well. They have told you and me, they are telling you and me, to provide names of lay people who will gladly help maintain osteopathic institutions at a high level. They are telling us where our dollars will count for the most.

Your money, my money, the money of our friends, must be spent *now*. It is being spent *now*. Month after month THE JOURNAL has told of programs, enlarged faculties, more and better laboratories, new buildings to enable the colleges to maintain their place in the march of progress and of service.

Yesterday is gone. Tomorrow will never come. Today is all there is. You and I must act now, so that the colleges can spend *all* their time on training doctors and expanding their facilities and services, rather than putting in a lot of it appealing for the money.

To that end the Osteopathic Progress Fund Committee is going right forward, on a national scale, correlating the efforts of the various groups, eliminating duplication, endeavoring to direct every particle of effort into the most effective channels. You and I will do well to carry out the requests and directions of this committee as expeditiously and completely as possible.

THE JOURNAL OF THE
AMERICAN OSTEOPATHIC ASSOCIATION
Published monthly by the American Osteopathic Association

Publication Office, 100 S. Kenilworth Ave., Oak Park, Ill.
Editorial Office, 540 N. Michigan Ave., Chicago 11, Ill.
Address all communications to the Chicago Office

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Subscription - - - - - - - - - - Ten dollars a year in advance

Vol. 43 January, 1944 No. 5

THE INTERVERTEBRAL DISC PROBLEM

Since the establishment of the protruded intervertebral disc as a distinct clinical and pathological entity, the general osteopathic practitioner as well as the general M.D. practitioner has been on the watch for this condition among those patients coming for relief of intractable low-back pain or sciatica or both. From practical experience these doctors probably have found that the diagnosis of protruded intervertebral disc is not as easy as some orthopedic specialists would have them believe.

In one of the latest articles on the subject, by J. Grafton Love and Maurice N. Walsh[1] of the Mayo Clinic, the statement is made that "the diagnosis . . . should not cause any difficulty when the patient presents the so-called classic picture and gives the typical history," which they describe as follows:

> If a patient walks into the examining room with a listing of the body and appears to be suffering from pain, one is likely to find on examination . . . that there is a loss of the lumbar lordosis . . . marked spasm of the erector spinae muscles and limitation of the spinal movements. Hyperextension is likely to be not only limited but extremely painful . . . There usually is tenderness over the spinous processes of the lowest lumbar vertebrae. When the patient is examined while in the dorsal recumbent position, straight leg raising is limited and painful on the side of the sciatic pain . . . Kernig's sign, likewise, will be positive and bending of the head forward on the chest will in some cases aggravate the low-back or sciatic pain or both. The course of the sciatic nerve from the sciatic notch to the terminations of its terminal branches should be palpated to elicit the tenderness which in some cases is extreme . . . The Achilles reflex on the side of the sciatic pain is usually diminished or absent . . .
>
> The history of the patient presenting the foregoing findings in the typical case would be something like this: He or she is accustomed to heavy work which entails the placing of unusual stress or strain on the back. After some particularly unusual stress or strain there was an onset of backache which may have been associated immediately or subsequently with extension of pain along the course of one sciatic nerve, rarely both . . . The pain has been aggravated by lifting, coughing, sneezing or straining at stool and has disturbed the patient's sleep . . .

[1]Love, J. Grafton, and Walsh, Maurice N.: Protruded Intervertebral Discs. Surg., Gynec. Obst., 1943 (Nov.) 77:497-509.

It would be difficult to convince a doctor of osteopathy that such a "simple story" is conclusive evidence of a protruded disc. Many patients with the same story have been relieved of all low-back symptoms permanently by manipulative treatment administered skillfully for the correction of a fourth or fifth lumbar lesion or a sacroiliac lesion. On the other hand, manipulative therapy can be a great boon or a great evil, as brought out by Eggleston in the leading article in this issue of THE JOURNAL. "Acting too promptly on the assumption that the condition is a typical sacroiliac lesion may lead to embarrassment, and possibly to further aggravation of the condition," says this osteopathic writer. He points out that "the results obtained depend upon the good judgment and skill of the operator," and cautions that "shotgun technics should be eliminated from all therapy."

The application of routine manipulative procedures to the low-back structures without careful analysis of the underlying trouble is just as bad as making a cursory inspection and rushing the patient off to surgery on the assumption that he has a protruded disc. The D.O. may be guilty in the first and the M.D. in the latter instance.

But to get back to diagnosis upon which hinges the decision of the general practitioner whether or not to refer a patient to surgery. It is interesting to see to what extent neurologic signs may or may not aid the doctor in arriving at a diagnosis. In 285 cases of protruded lumbar disc (proved at surgery), Love and Walsh found a positive Laseque sign in 81 per cent; diminished or absent Achilles reflex and sciatic tenderness, each 60 per cent; and muscular paresis and sensory loss each 22 per cent. Examination was objectively negative expect for positive Laseque sign or sciatic tenderness in 15 per cent. Since many conditions other than protruded disc may involve the sciatic nerve and result in sciatic tenderness and Laseque's sign, it may be concluded that neurologic findings alone aid very little in the solution of the problem.

Examination of spinal fluid has also been disappointing from the diagnostic standpoint. Love and Walsh report that "since most of the protrusions encountered are relatively small and usually irritate and compress only one nerve root, the vast majority of the patients do not have a disturbance of the hydrodynamic relations of the cerebrospinal fluid, and the total protein content of the fluid is usually not markedly elevated."

Roentgenologic examination may give one a clue to disc disturbance, although the ruptured disc cannot be shown by x-ray. Eggleston associates disc trouble with narrowing of the intervertebral space (shown particularly in the weight-bearing study), change in the size and contour of the intervertebral foramen, and an isolated lipping of the

anterior margins of the vertebral surfaces adjacent to the involved disc.

Special x-ray technics involving the use of lipiodol and air or oxygen appear to be losing in popularity. Love and Walsh say that in their experience clinical diagnosis is just as accurate as the roentgenoscopic diagnosis obtained by the aid of radiopaque oil and more accurate than that obtained by the aid of air. However, they use the latter almost routinely just prior to operation, "to exclude an unsuspected intraspinal neoplasm and the presence of multiple lesions."

Experienced roentgenologists are well aware of the many pitfalls in the interpretation of air myelograms and the general practitioner should not expect them to diagnose and localize protruded discs without a knowledge of the history and other findings.

In connection with the incidence of protruded disc, according to Dr. Henderson, chief of the Section on Orthopedic Diagnosis at the Mayo Clinic, he and his associates in that section were called on, in 1940, to see approximately 5,500 patients who had backache as a symptom (including backache, sciatic pain, root pain, spondylitis, spondylolisthesis, sacroiliac disease, symptoms causing suspicion of a protruded disc, fibrositis, etc.). Only 13 per cent of the 5,500 patients were found to have one or more protruded disc as the cause of their complaints.

Even though the percentage is small, Eggleston reminds us that the condition does occur and should be recognized as such. Almost every osteopathic physician has had the painful experience of losing the odd low-back patient because he failed to respond to corrective technic and physical therapy. Some of these patients undoubtedly were candidates for surgery, but they should have gone to surgery under osteopathic direction, not in spite of osteopathic care. Again Eggleston says, "It is . . . hasty diagnosis, based on blind faith in the efficacy of manipulative therapy, that leads to criticism for failure to recognize the occasional surgical case."

The diagnosis of protruded disc is indeed difficult because the symptoms arising from this condition are so similar to those arising from other mechanical perversions. The persistent, the recurrent, and the posttraumatic low-back case demands the greatest skill of which the osteopathic physician is capable. There should be an evaluation of postural faults, palpatory diagnosis of osteopathic lesions, and a differentiation between the acute and chronic lesion. Anatomical variations that might bring about postural faults must be recognized. This field includes such things as short lower extremity and developmental changes in the pelvis and lumbar spine.

After an exhaustive study has been made, if there still is a suspicion of herniated disc, every form of conservative treatment should be exhausted before referring the patient to surgery. This requires careful analysis and careful planning of therapy with or without actual manipulative work. Eggleston, in the concluding paragraph of his excellent article, quotes J. C. Williams, M. D., who says: ". . . It has been the writer's experience that a well-planned conservative program will eliminate the need for surgery in most cases."

R.E.D.

SULFADIAZINE IN COLDS

According to a report in *The Journal A.M.A.*, June 19, sulfadiazine in the treatment of severe colds shows no superiority over older established drug therapy. The experiment is reported by Lieut.-Col. Howard A. Rusk and Capt. Arie C. van Ravenswaay, both of the Medical Corps, U.S.A., and covers 670 cases among soldiers at Jefferson Barracks, Mo. All of the patients were sick enough to be sent to the hospital. Sulfadiazine was given to 317, while another 314 were given A.P.C. capsules, containing aspirin, phenacetin, and citrated caffeine. The remainder were given Dover's powder, an ipecac and opium mixture, with such poor results that the treatment was discontinued.

Fifteen cases of pneumonia developed in the group that were given sulfadiazine as compared with fourteen in the group treated with A.P.C. capsules. In the sulfadiazine treated group fever lasted an average number of days of 2.7 and the patients were able to leave the hospital, on the average, in 7.2 days. In the group treated with A.P.C. capsules the fever lasted an average of 3.1 days and the patients were able to leave the hospital, on the average, in 7.4 days.

There were no appreciable difference in the complications between the two groups and no deaths.

In connection with the use of sulfadiazine, findings of laboratory and clinical studies reported in *The Journal A.M.A.*, August 21, indicate that kidney damage and obstruction of the urinary tract are preventable by means of alkali treatment sufficient to maintain the urine neutral or slightly alkaline. The investigators believe that sodium bicarbonate should be prescribed whenever sulfadiazine is administered.

R. E. D.

GROWING INTEREST IN DOCTORS' MEETINGS

In the JOURNAL for July, 1943, it was pointed out that doctors everywhere must get together in meetings, large or small, in the interest both of military medicine and surgery, and of civilian health. Immediately thereafter the A.O.A. War Service Conference set a high mark in attendance and interest, followed by a series of very well-attended divisional and regional meetings.

These are among the things which augur well for the success of regional, state and provincial meetings which next spring will bring doctors together for additional review and instruction, culminating in the conference to be held by the American Osteopathic Association in Chicago, July 14 to 18 inclusive, at the Palmer House.

PROGRESS COSTS—ARE YOU PAYING?

More and more state and provincial osteopathic societies are undertaking to educate both their own members and the laity as to the rightful place of osteopathy in public as well as in private health. In war, in industry, in the general postwar picture, osteopathy must play a part different from that of days gone by. Then, every case was individual and every patient made his own choice of therapy and physician.

Call it socialized medicine or what you will, it is a fact that industrial compensation laws, insurance policies, the health plans of fraternal organizations, social security — all these and more are increasing the degree to which health service is a cooperative enterprise. Many laws and regulations and policies say, by implication or specifically, that the recipient of such service shall be unrestricted in his choice of school of medicine and practitioner. In order to secure and maintain this right of choice, and in order to implement that right, it is more than ever before essential that there be a general understanding of osteopathic fundamentals, and of the scope of its practice.

The problem is nation-wide; it demands correlation of effort. Some divisional societies direct their attention to office-holders within their jurisdiction; some especially to lawyers, some to college people, some to the public in general. Each time another society undertakes this supremely important work, it calls for an increased amount of service from the A.O.A. because of the function of the latter as a clearinghouse of methods and ideas. In cases where a newly launched plan is according to pattern it may cost the Association less additional than if it pioneers new paths, but in every case it costs work and money. And each time it is a good investment, because even without considering the benefit to the public of the increased knowledge, it brings real returns to the profession and to the individuals who make it up.

Osteopathic colleges are engaged in a great forward movement, erecting classrooms, clinics, laboratories, libraries, hospitals; building up their faculties, improving their curricula; providing more facilities; increasing their ability to receive students and train them into physicians. To do these things costs them more money than they have spent in the past. The costs are not only upon the colleges and upon the individuals who have contributed to their funds. This advance has cost the A.O.A. many thousands of dollars this year because of its part in the Osteopathic Progress Fund Campaigns. And it has been money well spent. Also it will continue to cost the A.O.A. money, not only directly in connection with the campaign, but also because of greatly increased demands upon the Bureau of Professional Education and the continuing vocational guidance activity.

The colleges definitely serve the public on a constantly increasing scale. They serve the profession, and every person in it. On the basis of their excellence depends much of the future of osteopathic recognition and on the quality of their graduates depends much of the ability of the practicing osteopathic physician of today to retain his opportunity to serve. The efforts of the colleges are directed to making more doctors, but the income from students cannot at all be expected to support them. Therefore this type of expenditure is a legitimate source of expense to the Association and to every individual in it.

These are two examples of many fields in which the membership is demanding more from the organization, is getting more from the organization, and finds it necessary to pay more to maintain the service given by the organization.

That is the reason the House of Delegates at Detroit last summer voted that beginning June 1, 1944, dues in the American Osteopathic Association shall be $30.00 a year.

The temper and attitude of those who expressed themselves on the subject before the Detroit meeting, at that meeting, and since, indicates that the membership will take that change in its stride and go on as it has gone in the past with a larger per cent every year enrolled in the Association and supporting it with both money and work.

EXECUTIVE COMMITTEE MEETING

The Executive Committee of the American Osteopathic Association, consisting of President Bailey, Past-President Tilley, President-Elect Starks, Vice-President Dooley, Drs. Robuck and Watson, Chairmen of the Departments of Professional and Public Affairs, and Executive Secretary McCaughan, met in Chicago December 10-12. The meeting was attended, as is required, by Chairman Swope of the Department of Public Relations, and Chairman Thorburn of the Division of Public and Professional Welfare. The midyear meeting of the American Association of Osteopathic Colleges, attended by representatives of all six approved colleges, met at the same time and in the same building, so that joint conferences could be held.

Plans were made for further developments in the Osteopathic Progress Fund Campaign, and forward steps were taken in the organization of the overall campaign, at the head of which are Drs. Tilley, Bailey, and McCaughan.

Progress was reported in connection with the program of the War Service Conference to be held in Chicago, July 14-18, 1944.

Many bureaus and committees reported their activities in carrying out the plans made at the Detroit meeting last July, and plans for the remainder of the fiscal year.

FLASH!!

Osteopathic Progress Fund Announcement

General overall campaign to start with new year.
Kirksville college completing steps to launch drive.
Subscriptions to college funds now $565,776.32.

Slogan: "Give to the College of Your Choice or to the Overall Fund! But Give!"

Progress Funds for the expansions of the approved osteopathic colleges exceeded $565,000.00 as of December 15, when it was announced that the Kirksville College of Osteopathy and Surgery is completing steps to join the campaigns and that the general (overall) fund-raising program for osteopathic education being organized by the Osteopathic Progress Fund Committee of the A.O.A. will get under way immediately after the first of the year.

The Osteopathic Progress Fund Committee of the National Association was instructed to proceed to launch the overall program by the Executive Committee of the A.O.A. at the latter's mid-winter meeting in Chicago, December 10 to 13. Methods and procedures to be employed were agreed upon by the Executive Committee and the Osteopathic Progress Fund Committee of the A.O.A. and the American Association of Osteopathic Colleges during this meeting.

Dr. R. McFarlane Tilley, chairman of the National Progress Fund Committee, of which Dr. Walter E. Bailey, President, and Russell C. McCaughan, Executive Secretary of the American Osteopathic Association, are also members, announced:

"The overall campaign will supplement but will not substitute for the present college campaigns. The slogan will be: 'Give to the college of your choice, or to the overall Osteopathic Progress Fund! But Give!' Contributions directly to the overall fund will be divided equally among the colleges. The American Osteopathic Association will act as financial transfer agent to accept contributions to the overall fund or to any of the colleges, individually, and pass the money on according to the stipulations of contributors."

Thus the Executive Committee of the American Osteopathic Association raised a rally signal for an osteopathic victory march of dollars toward greater and better institutions for the teaching and training of osteopathic physicians and surgeons. Details of the general (overall) fund-raising program, its formidable array of sponsors and leaders, et cetera, will be announced to every member of the profession early in January and in the February issue of THE FORUM OF OSTEOPATHY.

The Osteopathic Progress Fund of the Chicago College of Osteopathy jumped into second place in the fund-raising campaigns, as of December 15, with the largest amount subscribed, next to Kansas City. Subscription totals as of this date were:

Kansas City	$149,661.81
Chicago	114,493.06
Los Angeles	104,515.45
Des Moines	101,240.00
Philadelphia	91,500.00
Received by A.O.A. earmarked for overall fund and different colleges	4,366.00
Total	$565,776.32

Watch for these announcements! They'll contain news of vital interest to and affecting the welfare of every practicing osteopathic physician and surgeon, every student now in the colleges and every student who enrolls in the future. Why? Because the osteopathic profession rests its very foundations in osteopathic education. In the meantime, every doctor of osteopathy is asked to help carry the victory banner on which this slogan has been so largely inscribed:

"GIVE TO THE OSTEOPATHIC COLLEGE OF YOUR CHOICE, OR TO THE GENERAL (OVERALL) OSTEOPATHIC PROGRESS FUND! BUT GIVE!"

The Executive Committee of the A.O.A. also instructed the Osteopathic Progress Fund Committee of the Association to proceed with plans for a general appeal to the laity. The Organization and Leadership Committee which is to function to set up a National Board of Sponsors for the public campaign is near completion, and is also expected to start functioning immediately after the New Year.

MAKE 1944 VICTORY YEAR FOR OSTEOPATHIC EDUCATION!

Department of Public Relations

CHESTER D. SWOPE, D.O.
Chairman
Washington, D.C.

FATHERS' DRAFT LAW

On December 5, 1943, the President signed the fathers' draft bill, now known as Public Law 197. National Headquarters of Selective Service promptly issued implementing regulations putting the various provisions of the law into effect. Significant provisions of the law and regulations include the following:

(1) No more 3-A (dependency) deferments are to be granted. All present 3-A deferments will be reclassified.

It has been the policy of Selective Service to prefer dependency deferment over occupational deferment, that is, wherever a registrant was entitled to dependency deferment, he was given a 3-A. Dependency preceded occupational considerations in order of deferment. As a result, osteopathic physicians having dependents were given deferments in 3-A rather than 2-A. Those 3-A classifications will now be reclassified, and in view of the listing of osteopathy as an essential occupation in an essential activity, such osteopathic physicians as are actively engaged in the practice of their profession will be entitled to consideration in individual cases for occupational deferment in class 2-A. Osteopathic physicians having a 3-A classification and being over 38 years of age would be considered for occupational deferment in class 2-A (H). The "(H)" signifies the registrant is over 38 years of age.

(2) The terms "child" and "father" are defined as follows:

S.S.R. 622.23 Certain relatives defined. (a) The term "child" as used in these regulations means a legitimate child born prior to September 15, 1942, a stepchild, adopted child, foster child, or a person who is in the relationship of child to the registrant, who became such prior to December 8, 1941, who is less than eighteen years of age, or who by reason of mental or physical defects is incapable of self-support, who is unmarried, and with whom the registrant has maintained a bona fide family relationship in their home since December 7, 1941, or since the date of birth if such date of birth is later than December 7, 1941.

S.S.R. 622.33 (d) The term "father" shall include only a person who was married prior to December 8, 1941, who has maintained a bona fide family relationship with his family since that date, and who has a child as defined in this section.

(3) On December 10, 1943, the Director of Selective Service amended Local Board Memorandum No. 123, entitled: Fathers To Be Reclassified But Not To Be Inducted until after available volunteers and nonfathers. The memorandum states: "One of the objectives sought to be accomplished by Congress in adopting the recent amendments to the Selective Training and Service Act of 1940 was to delay as long as possible the induction of fathers. In order to do everything within the power of the Selective Service System to give effect to this purpose of Congress, local boards and appeal boards will continuously review deferred classifications to the end that no nonfather shall continue in a deferred status longer than required by the national interest." The reclassification of fathers is to determine the fathers who will be available to meet calls and those who will be deferred because they are in war production or in activities supporting the war effort.

The memorandum instructs local boards, in reclassifying registrants, to pay particular attention to the following questions: "(*a*) Should the registrant be deferred by reason of his agricultural occupation or endeavor? (*b*) Should the registrant be deferred by reason of his employment in war production or in support of the war effort? (*c*) Should the registrant be placed in class 3-D?" (Extreme hardship and privation to wife, child, or parent.)

In determining question (*b*) local boards are required to consider the provisions of Local Board Memorandum No. 115. The memorandum instructs the local boards that the provision of LBM No. 115 and other applicable instructions "will be liberally construed. Fathers who are eligible for occupational deferment under the provisions of Local Board Memorandum No. 115 and who are making contributions in war production or in support of the war effort are usually stable employees and, if other factors are equal, will normally be accorded deferment in preference to nonfathers." Local Board Memorandum No. 115 expressly refers to the occupations mentioned in Activity and Occupation Bulletins as: "The most important activities and occupations with respect to war production and in support of the war effort."

Activity and Occupation Bulletins 32 and 33-6, which have to do with the deferment policies respecting osteopathic practitioners, preprofessional and professional students, and osteopathic interns, remain in full force and effect.

Osteopathic physicians who are engaged in active practice of their profession who are now in class 3-A by reason of family relationship will, now that class 3-A is abolished, be reclassified and they will be eligible for class 2-A by reason of their occupation as necessary in support of the war effort. In making the reclassification from class 3-A it may be determined that the registrant is eligible for class 3-D by reason of extreme hardship and privation to wife, child or parent. The order of consideration of classifications calls for consideration of eligibility for class 2-A before considering eligibility for class 3-D.

(4) All occupational deferments which were in effect on December 10, 1943, in cases where the registrant is employed in a location outside the appeal board area of his local board, must on or before January 9 be passed on by the appeal board for the area in which the registrant is now located. The local boards are required to determine all instances where the principal employment of their registrants is outside the local board appeal area and proceed to forward the registrant's file through Selective Service channels to the appeal board for the area or the registrant's principal employment.

(5) All appeals pending on December 10, 1943, and all appeals taken thereafter will be transferred to the appeal board of the registrant's principal place of employment. It is therefore no longer necessary for a registrant to request transfer of appeal in occupational cases or any other cases, since such transfers are now automatic where registrant's local board and his principal place of employment are in different appeal board areas. Selective Service Regulations sections 627.71 and 627.72 which previously outlined the procedure in transfer of appeal in occupational cases have been cancelled.

All appeals must be filed with the registrant's local board.

(6) On December 10, 1943, the Director of Selective Service issued Local Board Memorandum No. 188 regarding necessary changes in appeal procedure, as follows:

SUBJECT: APPEAL PROCEDURE

PART I—GENERAL

Law.—On December 10, 1943, the Selective Training and Service Act of 1940, as amended, was further amended by the addition of subsection (1) to section 5 of the Act. Subsection (1) in part is as follows:

"(1) In case of any registrant whose principal place of employment is located outside the appeal board area in which the local board having jurisdiction over the registrant is located, any occupational deferment under subsection (c) (2) or subsection (e) of this section (section 5) existing at the date of enactment of this subsection shall within thirty days after such date, and any such occupational deferment made after the date of enactment of this subsection shall within ten days after such deferment is made, be submitted for review and decision to the selective service appeal board having jurisdiction over the area in which is located the principal place of employment of the registrant."

PART II—APPEAL BY LAW FOR CERTAIN REGISTRANTS DEFERRED IN CLASS II-A OR CLASS II-B ON DECEMBER 10, 1943

File of registrant whose classification is appealed by law to be forwarded for review and decision of the board of

appeal before January 9, 1944.[1] On or before January 9, 1944, every local board shall, in the manner provided by section 627.13, Selective Service Regulations, forward for review and decision of the board of appeal in whose area is located the registrant's principal place of employment, the file of each registrant:

(*a*) who on December 10, 1943, is in Class II-A or Class II-B (regardless of whether he was so classified by a local board, a board of appeal,[2] or the President)[3] and

(*b*) whose principal place of employment and local board of jurisdiction are in different appeal board areas.

PART III—APPEAL BY LAW FOR CERTAIN REGISTRANTS PLACED IN CLASS II-A OR CLASS II-B AFTER DECEMBER 10, 1943

File of registrant whose classification is appealed by law to be forwarded for review and decision of the board of appeal within 10 days after he is classified.[1] Within 10 days after he is classified, the local board shall, in the manner provided by section 627.13, Selective Service Regulations, forward for review and decision of the board of appeal in whose area is located the registrant's principal place of employment, the file of each registrant:

(*a*) who after December 10, 1943, is placed in Class II-A or Class II-B by the local board and

(*b*) whose principal place of employment and local board of jurisdiction are in different appeal board areas.

PART IV—APPEAL FROM ANY CLASSIFICATION

1. Procedure when appeal was taken on or before December 10, 1943.—(*a*) Whenever an appeal was taken on or before December 10, 1943, by any person entitled to appeal from any classification of a registrant, and such appeal has not been finally disposed of on or before December 10, 1943, the local board, board of appeal, or the President, whichever has possession of the file, shall determine the address of the principal place of employment of the registrant.

(*b*) If the registrant's principal place of employment and the local board having jurisdiction over the registrant are in different appeal board areas, the board of appeal or the President in possession of the file shall take no further action in the case but shall immediately return the file to the local board. The local board shall then forward the file in the manner provided by section 627.13, Selective Service Regulations, to the board of appeal having jurisdiction over the principal place of employment of the registrant.

(*c*) If the principal place of employment of the registrant and the local board having jurisdiction over the registrant are in the same appeal board area, or the principal place of employment of the registrant is located in an area where boards of appeal are not organized, or the registrant is unemployed, the appeal board or the President, whichever has possession of the file, shall handle and determine the appeal in the same manner as heretofore, and, after determining the case, shall return the file to the local board.

2. Procedure when appeal taken after December 10, 1943—(*a*) Whenever an appeal is taken after December 10, 1943, by any person entitled to appeal from any classification of a registrant by a local board, the local board shall determine the address of the principal place of employment of the registrant.

(*b*) If the principal place of employment of the registrant and the local board having jurisdiction over the registrant are in different appeal board areas, the local board will forward the appeal in the manner provided in section 627.13, Selective Service Regulations, to the board of appeal in whose area is located the registrant's principal place of employment.

(*c*) If the principal place of employment of the registrant and the local board having jurisdiction over the registrant are in the same appeal board area, or the principal place of employment of the registrant is located in an area where boards of appeal are not organized, or the registrant is unemployed, the local board will forward the registrant's file to its own appeal board in the manner provided in section 627.13, Selective Service Regulations.

LEWIS B. HERSHEY
Director

1. Section 5 (1) of the Act does not provide for an appeal by law in any of the following cases: (*a*) Where the principal place of employment of the registrant and the local board having jurisdiction over the registrant are both in the same appeal board area. (*b*) Where the principal place of employment of the registrant is located outside an area where boards of appeal are organized.

2. Except where the classification of the registrant was made by the board of appeal having jurisdiction over the area in which the principal place of employment of the registrant is located.

3. Except where the classification of the registrant was made by the President on appeal from the board of appeal having jurisdiction over the area in which the principal place of employment of the registrant is located.

SHORTAGE OF MEDICAL MANPOWER

On October 12 the Surgeon General of the U. S. Public Health Service told a Congressional Committee that: "Forty-one per cent of the effective medical manpower is now on duty in the armed forces." He also said that the Procurement and Assignment Service had been told that: "The Army needs many more doctors than it has and that it is not now getting its quota."

Before the war 100 per cent of the medical graduates were needed to replace civilian doctors. Now, approximately 80 per cent of the medical graduates are consigned to the armed forces. That means 20 per cent instead of 100 per cent of recent medical graduates will be available for civilian care. Continuing his statement to the Congressional Committee, the Surgeon General said: "Many patients, war workers and their families, I am sure, lose a lot of time from production lines by sitting in doctors' offices for long hours. Other reports are to the effect that you cannot make an appointment to see a doctor in his office inside of a week and in still other instances a war worker will sit around in a doctor's office for hours waiting to be cared for. Other instances have come to my attention where a man, in spite of the high wages he is getting in a war plant, has decided to pull up stakes and go back home because his baby was sick and he could not get medical attention—all related to the same general idea, namely, the loss of productive efficiency because of the lack of medical care."

The following significant statement was also included in the Surgeon General's remarks: "I am sure the medical situation in the civilian population will continue to deteriorate. The older doctors are dying off fast, *and each week we hear of one or the other area in which a situation which seemed comfortable a few months ago is now desperate.*"

On October 8 Dr. Frank H. Lahey, Chairman of the Directing Board of Procurement and Assignment, told a Congressional Committee: "I want to put this before you, that we have been very lucky so far in this country not to have an epidemic. *I hate to think what would happen to the country if we had an epidemic.*"

Dr. Maxwell E. Lapham, Executive Secretary of Procurement and Assignment said, in regard to the localities in need of physicians: "We have not made a complete appraisal. If we could make a complete appraisal of every community in the country needing medical services, it would be probably three or four thousand, instead of 300."

STATE MEDICINE

At a recent hearing before the House Appropriations Committee the Surgeon General of the U. S. Public Health Service, Dr. Thomas Parran, in urging a one million dollar appropriation for the commissioning of 300 physicians in the Public Health Service for their assignment to needy areas and the re-location of 300 other private physicians to such areas, the areas of assignments and re-locations to be determined by applications on the part of the state health officers to the Public Health Service for assistance, the Surgeon General was asked whether or not such a project might be considered state medicine. Said the Surgeon General:

"In order to give an accurate answer, I think we should have to define that term. The Public Health Service was formed to carry out a certain form of state medicine. The original act was passed in 1798. So I cannot say that I am against state medicine or socialized medicine, when the Fifth Congress of the United States passed an act establishing the first system of compulsory state health insurance, namely, the monthly check-off on the wages of the merchant seamen, which was used to pay the salaries of full-time and part-time doctors in the several ports of the United States. That compulsory health insurance was continued and expanded for 80 years, and then the Congress in its wisdom decided that a tax on the employees' wages was not the preferable method of financing it and substituted a tonnage tax in its place. All this might be considered strictly a state medical function."

The House Committee refused to recommend the appropriation, taking the position that the medical needs would voluntarily be met without the necessity of Federal intervention. When the bill, a Supplemental Appropriation Bill, H.R. 3598, reached the Senate, the Senate decided to allow approximately one-half of the appropriation for the item which would be used exclusively for re-location of private physicians. In other words, the idea of Public Health Service commissions for physicians and their assignment by the Government to needy areas was rejected. Under the plan as approved by the Senate the municipality or county desiring a physician would make application to their State Health Department, who, after its approval, would forward the application to the Public Health Service, and the Public Health Service would contract with private physicians to re-locate. As an inducement to re-location, the Federal government would finance the re-location in the amount of $250 a month for the first three months. The municipality or county making the request would have to pay $100 toward the re-location. The re-located physician would be entitled to all professional fees, and in order to receive the remunerative inducements from the Public Health Service for re-location, he would agree to stay at the new location for at least a year.

Something like 100 physicians a month are being discharged by the armed forces, some 50 per cent of which have disabilities that will not interfere with their resumption of private practice. It is expected a percentage of these may be induced to accept these new locations.

It is likely that the appropriation as thus approved by the Senate will be accepted by the House.*

*As finally passed by Congress, the amount of funds to be used by the Public Health Service for location of private physicians in areas of medical need was reduced to $200,000 and the local communities are required to contribute 25 per cent of the amount.—C. D. Swope, D.O.

UNDERGRADUATE ESSAY PRIZE CONTEST

The undergraduate essay contest for the current year is to be known as the Undergraduate Essay Prize Contest, the prizes to be awarded in competition among the students of approved colleges of osteopathy.

A cash prize of $25.00 will be awarded to the author of the best paper submitted *in each school in which there are four or more contestants. If at least four schools have a minimum of four contestants each,* a grand prize of an additional $25.00 in cash will be awarded to the writer of the paper adjudged to be the best among the prize-winning papers from the competing schools.

The following outline is suggested for the treatment of the subject assigned for this year:

The Osteopathic Management of Influenza

1. Etiology—(Brief)
2. Pathology—(Brief)
3. Diagnosis—(Brief)
4. Osteopathic Principles
5. Treatment
   (*a*) General Management
   (*b*) Manipulative Therapy
6. Clinical Course—Summation

The competition is to be judged on the basis of papers of not more than 2,000 words on the assigned subject.

It is the donor's wish that as many undergraduates as desire shall participate in the contest in each school. The main purpose of the contest is to promote original investigation and thought among osteopathic students and the contest will doubtless be more worth while if instructors in each of the colleges will direct the attention of the contestants along practical clinical research lines.

Entrants in this contest should prepare their papers in *typewritten form,* if possible, *double spaced on one side of the paper* and with *liberal margin.* Manuscripts should be submitted with a number instead of name, a corresponding number to appear on an accompanying envelope containing the name, address, and school of the contestant.

A standard will need to be set for grading the various points to be considered. A suggested but not an arbitrary distribution of points, determined after consultation with various authorities, is as follows:

Subject matter	50
Accuracy of statement	10
Originality	10
Literary excellence	20
Bibliography and sources of authority	10
(May be in addition to specified length of essay)	
Total	100

A committee of three members from the faculty of each school will be asked to judge the manuscripts submitted from the undergraduates of that school, and the award in each college will be made solely upon the basis of the decision of the faculty committee.

The winning manuscript from each college must be received in the Central Office of the A.O.A. not later than April 15, 1944. The deadline for the receipt of manuscripts in each college will be set and announced by the committees in the respective colleges.

The winning manuscript in each school, properly identified, will be judged by a committee set up by the Executive Committee of the American Osteopathic Association. The announcement of the award will be made in the general sessions during the annual convention of the Association in July, 1944.

The donor reserves the right of publication of any or all of the winning essays.

R. C. McCaughan, Executive Secretary,
American Osteopathic Association.

Department of Professional Affairs

S. V. ROBUCK, D.O.
Chairman
Chicago

BUREAU OF PROFESSIONAL EDUCATION AND COLLEGES

R. McFARLANE TILLEY, D.O.
Chairman
Brooklyn, N. Y.

M.D. UNIVERSITY QUITS

The Kansas City University of Physicians and Surgeons which has been a sore spot for a long time because of its conferring M.D. degrees on those not properly qualified and who could not even be admitted to examination in more than one or two states, will pass from the picture by June 1, according to a story in the *Kansas City Star* of November 27. The story says in part:

"Agreement by the school's officials to surrender the charter of the Kansas City University of Physicians and Surgeons by June 1, in face of threatened legal proceedings by the state board of health, was made known today by Dr. James Stewart, health commissioner.

"The state board, after a visit and inspection of the school's facilities at 2801 Troost Avenue, found that the institution's facilities are wholly inadequate for the teaching and proper instruction of candidates for the degree of doctor of medicine and recommended a suit by Roy McKittrick, attorney general, to revoke the charter.

" . . . In the meantime, Dr. Stewart said, the charter will be held in escrow in a Kansas City bank and the school will accept no new students. . .

"The State Board of Health adopted resolutions in October recommending the attorney general begin quo warranto proceedings against the school."

Current Osteopathic Literature

By R. E. Duffell, D.O.

OSTEOPATHIC MEDICINE PHILADELPHIA

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*A Review of Research. I. Introduction. Frederick A. Long, D.O., Philadelphia—p. 57.

A Background for Rational Therapy. II. Principles of Rational Therapy. Guy S. Deming, D.O., Philadelphia—p. 65.

Intrathoracic Adenoma Involving the Left Lobe of the Thyroid Gland. Report of a Case. Paul T. Lloyd, D.O., and Kenneth L. Wheeler, D.O., Philadelphia—p. 69.

Sciatic Neuralgia Following Forceps Delivery Treated by Lumbosacral Mobilization under Surgical Anesthesia. H. Walter Evans, D.O., and C. Haddon Soden, D.O., Philadelphia—p. 78.

Pituitary Obesity: Autopsy Report of a Case. Otterbein Dressler, D.O., Philadelphia—p. 81.

A Flanged Paraffin Block Holder Designed to be Attached While Moulding the Block. Boyd B. Button, Philadelphia—p. 85.

***A Review of Research. I. Introduction.**—With this issue of *Osteopathic Medicine* the editor, Frederick A. Long, begins a series of papers presenting a résumé of the work of the Department of Osteopathic Research of the Philadelphia College of Osteopathy from April 1, 1932 (the date the Department was established) to 1942. Through the years the Research Department has grown from one small room to five rooms with a total floor space of 1,000 square feet. Approximately $60,000 has been expended for original investigative work since 1932. The research program has been conducted under several general series as follows: 1. Study of Case Records, 2. The Effects of Various Physical Factors, Including Osteopathic Manipulation, upon Certain Measurable Physiological Processes in Both "Normal" and "Clinical" Subjects, 3. Study of Posture and Body Mechanics, 4. Roentgen Study of Normal and Abnormal Vertebral Mechanics, 5. Study of Certain Diseases Treated by Controlled Manipulative Procedures, 6. Study of the Osteopathic Spinal Lesion and miscellaneous studies in the various related sciences. Dr. Long intends to cover the work completed under certain of these series in future issues of *Osteopathic Medicine*.

Some introductory remarks from the current issue are as follows:

"Challenging realities which are inextricably bound with our future progress are all about us, and they are inescapable. What we do about these things now will determine the pattern of osteopathy for the future. Forward progress must rest upon acceptance of the fact that we are part of general medical evolution, otherwise we will soon be left by the wayside of onrushing events. . . .

"The basic truths upon which the principles of osteopathy have been founded are a solid enough rock, but the applications of these principles in the light of constantly unfolding discoveries and advancements must recognize the fact of change—the only constant thing in life. It must be our burden to correlate the sound contributions of the osteopathic school with the moving panorama of medical evolution. This is our imperious inner necessity, and research is the principal implement through which it will be satisfied. . . .

"Early osteopathic research logically concerned itself with a study of the spinal lesion, and some valuable contributions concerning it were made. The lesion theory is today one of the differentiating criteria between our school and the older school of medicine. There are, however, many other things in osteopathy ripe for investigation. Shall we, in view of this possible diversification of material for study, go before the world with the proposition that the proof of all osteopathic philosophy and practice rests alone upon proof of the effects of spinal lesion? Such a unilateral concept of things can never resolve all of the problems of osteopathic practice. It would seem to hold promise of greater fruitfulness to have our research based not only on study of the lesion, important as that might prove to be, but upon all phases of manipulation, and upon study of the relationship between all tried and proved methods of treatment which have become incorporated in osteopathic practice with what we are pleased to call 'our therapeutics.'"

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***A Study of Phlegmasia Alba Dolens (Milk Leg).—** Morris describes the etiological factors, diagnosis and treatment of phlegmasia alba dolens. This condition may follow childbirth, low abdominal or pelvic surgery, circulatory and debilitating diseases such as pneumonia and typhoid. The edematous swelling of the leg is due to obstruction in the lymphatics and veins of the pelvis. The veins involved are the upper femoral, the external and common iliacs. As Morris brings out, "It has been long established that uterine venous thrombosis at the placental site always occurs, and that the process of thrombosis extends variable distances into the myometrium. If infection occurs, thrombosis may extend farther, into the parametrium or beyond, even into the major vessels; and if the vessel walls are infected, the stage is set for the production of phlegmasia alba dolens."

The avoidance of "milk leg" includes several precautions. The most important is meticulous asepsis. Next is careful handling of tissues, particularly during operative procedures of the lower abdomen and pelvis. Contusions, ischemia, ecchymosis, laceration, defective coaptation by suturing, and inadequate hemostatis are carefully to be avoided. Hypotonicity of the emptied uterus and accompanying bleeding predispose to abnormal thrombosis and to phlebitis; therefore the immediate use of obstetrical pituitary solution following the second stage is recommended. Less immediate prophylactic measures are: the forcing of deep respiration postoperatively and the avoidance of postoperative and postpartum stasis in the veins of the lower extremities by elevation and exercise. Morris suggests the employment of carbon dioxide and oxygen postoperatively, which forces deep respiration at a period when all vital functions are at a low level. Routine deep breathing exercises are encouraged as soon as the patient is cooperative. Of equal importance is the promoting of venous drainage from the lower extremities by means of systematic toe, foot and leg exercises, two or three times daily.

The treatment of the condition in the early stage is elevation of the leg and the use of opiates as required for relief of pain. Diuretics to accelerate the drainage of fluids is good therapy. Ice bags or packs to the leg are contraindicated as these would only tend to retard circulation. As edema disappears, active exercises of the leg in bed is begun and continued, with assistance if necessary, for some days before the patient is encouraged to get up. Then with bandages applied up to the knee she begins to walk, going to bed between early attempts. From this time on, the use of the leg must slowly and regularly be increased. A return of edema is, of course, a sign of too much dependence and too little elevation. Supportive bandages should be continued as long as edema tends to return when such support is absent.

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Current Medical Literature

Herniation of the Nucleus Pulposus As a Complication of Pre-existing Low-Back Instability

Edwin M. Deery, M.D., in *Surgery, Gynecology and Obstetrics*, July, 1943, urges more general recognition of a group of patients in whom herniation of the nucleus pulposus is a complication of a preceding low-back instability.

The diagnosis of herniation of the nucleus pulposus has been greatly clarified in recent years. A careful neurologic examination will reveal the presence or absence of a herniated nucleus as well as its level without recourse to lipiodol in most cases. The history of herniated nucleus is that of sciatic neuralgia, that is, pain along the sciatic nerve. The sciatic pain is increased by all back movements and by coughing and sneezing. It may or may not be improved by bed rest. It is generally unrelieved or made worse by physiotherapy. It is considerably increased when the patient bends toward the side of the pain. The majority of patients date the onset of pain to a fall or a lifting strain.

The patient may appear fairly comfortable or may be first seen in acute pain. In the latter event there is generally a protective limp and the back is bent forward. There is a flat low back and the lumbar spine tends to curve away from the side of the pain. The specific signs of herniated nucleus in the lower lumbar spinal canal are mild, but definite. They are unilateral signs of mild losses in motor and sensory functions. Either motor or sensory signs may predominate and either, but not both, may be missing.

The majority of patients will show a little weakness in dorsiflexion of the foot on the affected side. Muscle atrophy is commonly found and may be demonstrated by careful measurements made at about 15 centimeters above and below the patella. Gluteal atrophy on the painful side is evidenced by a mild but definite flattening of the normal contour on the painful side. Almost all patients have a reduced or absent ankle jerk. Most patients will show characteristic sensory changes along the other side of the lower leg and on the foot.

Roentgenograms are of importance in orthopedic diagnosis, but are of less help in neurologic diagnosis. Lumbar puncture should be uniformly carried out as it may reveal spinal cord tumor. The spinal manometric reading is characteristically normal and the average protein reading is 50 milligrams, a slight elevation above normal.

When both a surgically unstable joint and a herniated nucleus are diagnosed, operations for both conditions should be carried out at one time. In the writer's experience, there was no mortality for 100 such operations. The present simplified neurosurgical procedure for removal of herniated nucleus does not offer any threat to the chances of successful fusion.

Three types of herniated nucleus are described. The first and most common type found at operations is a small round to oval mass, still covered by the overlying lateral portion of the posterior longitudinal ligament. Overlying the lesion is the spinal dura and the involved nerve root. The safest and quickest method of exposing the herniated nucleus

is to retract and coax the nerve root medially, over the prominence of the herniation. Less frequent is the herniated nucleus that has already forced its way partly or wholly through the posterior longitudinal ligament. This type can generally be picked up and removed in one piece with a minimum of exposure and effort. The least common type is the small, almost flat lesion which is missed by some and left untouched by others. The question as to whether or not this is a real herniation can be answered quite definitely. Removal of the lesion in the usual manner cures the patient's sciatic pain. Laboratory study of the specimen proves it to be typical nuclear material.

The question of fusion for low-back pain and sciatica is a purely orthopedic problem. If, however, the term "sciatica" implies the presence of a herniated nucleus, a major question can be raised. Will the immobilization by fusion relieve the patient with a real herniated nucleus? Experience with patients with herniated nuclei who have previously had a fusion points otherwise. Relief of sciatic neuralgia and recovery from sciatic neuritis come only after the herniated nucleus is removed. Fasciotomy does not relieve the sciatic pain of patients with herniated nucleus.

KATHERINE BECKER.

Reducing Fracture-Dislocations of Cervical Vertebrae

In the *Journal of Bone and Joint Surgery*, October, 1943, H. S. Morton, F.R.C.S., presents a method of reducing and immobilizing fracture-dislocations of the cervical vertebrae. The fundamental principles involved are the use of a firm support for the head during reduction, and the application of a plaster cast without moving the patient.

The equipment needed in using this method is a metal support twenty-five inches long by five inches wide at one end and tapering to a width of three inches at the other end. The broad end is clamped to the operating table so that the support, which is suitably padded, projects for a distance of eighteen inches. The patient is carefully placed in the supine position on the table, with the head just overhanging the padded, tapering end of the "ironing board." The shoulders are firmly secured in supports which serve as countertraction during manipulation. These must be extended beyond the end of the table to correspond with the position of the head.

In the average adult, the distance of the symphysis menti from the occiput is 18 to 21 centimeters, while the occipitoatlantal joint is 8 to 9 centimeters from the external occipital protuberance. With the end of the metal support placed just under the external occipital protuberance, approximately 6 or 7 centimeters from the occipitoatlantal joint, this distance is reduced by 2 centimeters and thus the mechanical advantage obtained by leverage is three to one.

Using the occiput as a fulcrum and the jaw as a lever, pressure is applied to the point of the jaw, and the head is gradually tilted backward until the hyperextended position is obtained. This movement raises the upper fragment, disimpacts the compression fracture, and corrects the dislocation. By this method it is possible to reduce fractures of the cervical vertebrae safely and steadily; the operator may stop at any time for a roentgenogram, as all movement is controlled and the occiput is held in constant position by the support. The operator may stand on either side or at the head of the patient.

When reduction has been satisfactorily obtained, as revealed by the roentgenogram, the patient is in the desired position for the plaster cast which is carried from the top of the head to the middle of the thorax. Then the patient may be moved horizontally along the table until the buttocks are at its edge, the back being supported by a stool. The "ironing board," which has served its dual purpose, is removed and the cast is completed to enclose the pelvic girdle. If this equipment is not available, a wooden substitute may be used. It is made from a piece of wood 6 feet long by 6 inches wide by ¾ of an inch thick (such as five-ply wood), with one end tapered to 3 inches. This may be placed on any suitable table so that the tapered end projects 18 inches, and the patient may be laid upon it as already described. The other end may be clamped or held down by sandbags; and the shoulder slings may be improvised from any suitable material and anchored around the legs of the table.

Two case histories are given. In one the cast was worn for three months, the patient doing exercises the last two. The roentgenogram taken after removal of the cast showed correct alignment. A Thomas collar was fitted and exercises with the full range of neck movements were carried out regularly. Six months from the time of injury the patient was able to return to naval duty, symptomless and with firm bony union. In the second case, the patient was allowed up after two weeks, but wore his cast for three months. A fitted Thomas collar was worn a further three months, except during periods of exercise. At the end of six months he was returned to naval duty with no symptoms, full function, and firm union.

The distinctive feature of this method is the degree of control it affords because the fixed support constantly steadies the neck, while leverage reduces the amount of force required to achieve reduction. The movement of the head around the fulcrum is the most direct route to the ultimate position; and elimination of all further movement before application of the cast makes the procedure simple, safe, and accurate.

KATHERINE BECKER.

Pruritus Ani

R. H. Aldrich, M.D., discusses pruritus ani in relation to absenteeism, reviews the literature and reports a new form of adjuvant therapy in *Industrial Medicine*, October, 1943. Pruritus, he says, is a torment often coupled with the increased tension and nervousness in modern war industry. No worker, skilled or unskilled, can carry on his work satisfactorily if his attention is constantly being drawn to his pruritus which lowers vitality and efficiency.

The impressive bibliography on this subject reveals the multiplicity of causes and the numerous treatments suggested to control it. The mere fact that there is so much controversy is evidence enough of the problems facing the physician treating pruritus ani. The literature indicates that from 10 to 25 per cent of the adult population are victims of one form or another of this disease.

Among predisposing causes worry, overwork, alcoholism, sedentary life, diabetes, gout, and liver disease can be found. Indirect causes include fissures, fistulas, hemorrhoids, cryptitis, lice, worms, scabies, fungi, and food and drug sensitivity. Direct causes are trauma, discharges from anal and vaginal regions, skin diseases, physical uncleanliness, and excessive sweating.

In most cases there are characteristic and persistent anatomical changes. At times there are merely pallor and dryness. Frequently there is distinct hypertrophy with deep furrows in the depths of which the skin is moist, excoriated, and red. Secondary excoriations are frequently found, caused by scratching. As the disease progresses the skin becomes moist, whitened and soggy, tending to peel, and the hypertrophy increases. There may be localized cellulitis and there may or may not be edema.

Most forms of therapy fall into two groups. Group one consists of lotions, powders, and ointments. Group two is composed of the anesthetic solutions to be injected under the skin in the perianal region. Surgery has been used by some in an effort to sever the sensory nerves entering the perianal region. X-ray and ultraviolet rays have been used extensively. Ionic therapy has been reported as valuable by Rolfe. Tattooing and electro-desiccation have also been tried.

For the past eight years the writer has been using a cod-liver oil ointment alone or in conjunction with the injection of 95 per cent alcohol following the technique of

Stone. Usually the ointment was used for a week and then the alcohol resorted to if necessary. While the results were gratifying, it was difficult to get the patients to apply the ointment themselves. About two years ago a 70 per cent cod-liver oil ointment was put up in a gelatin-capsule which tapers at one end for easy insertion into the anus, after an incision has been made on the side of the tip to permit expulsion of the ointment. This capsule was well-liked by patients.

The writer has used these capsules on twenty-nine patients. A high percentage of the cases were relieved, many totally so. The shortness of time required to bring about relief is considered important. The vast majority experienced relief in from two to three weeks. In comparison with reports of others on the use of local treatment, the results obtained with cod-liver oil seem superior.

Legg-Perthes Disease and Thyroid Function

The relationship of Legg-Perthes disease to the function of the thyroid gland is discussed by A. Bruce Gill, M.D., in the *Journal of Bone and Joint Surgery*, October, 1943. In 1936, Cavanaugh, Shelton, and Sutherland reported studies in five cases of Legg-Perthes disease and stated that in all of them they found definite evidence of thyroid deficiency. The author accepts their observations concerning the presence of colloid goiter in members of the families of the patients; retarded development of the bones of the hand; and other stigmata, such as delayed and faulty dentition, hypogenitalism, enuresis, palpable thyroid glands, and dryness of the skin and hair. However, he doubts that the administration of thyroid materially shortened the period of regeneration or healing of the head of the femur.

Many pediatrists and endocrinologists recognize the difficulties that exist in making an accurate diagnosis of hypothyroidism, alone or combined with other endocrine deficiencies, except in well-marked and long-continued cases. In children, defects in skeletal development which are due to delayed growth are the most characteristic signs. Mental sluggishness and lowered physical activity are usually seen to some degree in all cases of hypothyroidism. When many or all of the above signs are present in a child, a diagnosis of hypothyroidism may be established accurately. However, it must be remembered that some of these defects in structural growth may be found in children who do not have thyroid deficiency.

The author has made careful investigations on twenty cases of Legg-Perthes disease and found no evidence of hypothyroidism in any of them. Furthermore, one should not expect to prove that hypothyroidism is an etiological factor in this disease. So far as thyroid deficiency has been found to be related to skeletal abnormalities, it has been observed to cause delay in bone growth. Epiphyses are late in appearing in the roentgenogram, and there may be irregularities in the conversion of cartilage into bone. Legg-Perthes disease consists of degenerative or destructive changes of an epiphysis which was normal before the onset of the disease. There is no evidence to prove that thyroid deficiency will cause destruction of a normal epiphysis or metaphysis.

It is believed by some writers that Legg-Perthes disease is identical in its processes and probably in its etiology with what is called osteochondritis in other parts of the skeleton. Gill questions whether these diseases involve an epiphysis and a metaphysis that have previously been normal, and whether they manifest a similar cycle comprised of degenerative and regenerative phases, or are instances of true epiphyseal dysgenesis. Köhler's disease of the tarsal scaphoid affects bone that does not develop from an epiphysis. The epiphysis of the tibial tubercle develops long before the usual age for the onset of Osgood-Schlatter's disease. Osteochondritis of the spine appears at an age when the epiphyseal plates begin to appear in the roentgenograms. The writer is not sure that it can as yet be accepted that all types of osteochondritis are due to the same process and to one cause such as hypothyroidism. A fertile field for future investigations is offered.

KATHERINE BECKER.

Comparison of "Orthodox" and Kenny Treatment

Robert Bingham, M.D., reports on the Kenny treatment for infantile paralysis, and compares the results with those of older methods of treatment in *The Journal of Bone and Joint Surgery*, July, 1943. All patients in the County Branch of the New York Orthopedic Dispensary and Hospital under treatment for the acute stage and paralytic symptoms of poliomyelitis from May, 1941, to May, 1942, have been included in this study. These sixty patients have been divided into three groups.

Group one comprises twelve patients who received only conventional methods of early therapy, which Sister Kenny refers to as "orthodox."

Group two consists of twenty-four patients who were first treated by conventional routines for some weeks or months, and then by the Kenny method for the remainder of their therapy for the acute stage.

Group three comprises twenty-four patients who received only Kenny treatment from the beginning of the disease. They received all the fundamentals of this new therapy—bed rest in a natural position, hot moist packs to relieve muscle spasm and prevent contractures, passive motion to restore awareness, and the Kenny technique of muscle re-education to eliminate mental alienation and incoordination, and to restore muscle power.

Patients under the Kenny treatment are confined to bed and in the hospital a shorter time than previously was necessary. The use of hot moist packs is intensive for a period of weeks, but the total effort, time, and expense to the hospital and patient should be much less than with previous methods.

The presence of the symptoms of muscle spasm, mental alienation and incoordination in the acute stages have been verified. The role of untreated muscle spasm in forming muscle contractures and producing deformities has been demonstrated.

A comparison of early results of therapy shows that residual paralysis was present in 83 per cent of the patients in group one (under "orthodox" treatment), in 58 per cent of group two ("orthodox" and Kenny treatments combined), and in only 33 per cent of group three (Kenny treatment only). Residual deformities occurred in 75 per cent of group one, in 25 per cent of group two, and in 8 per cent of group three. Of the first group, six patients required braces or surgery; of the second group, eight; and of the third, four.

Functional results were considered excellent in one, good in three, fair in four, and poor in four of the twelve patients receiving "orthodox" therapy alone. They were judged excellent in six, good in eight, fair in seven and poor in three of the twenty-four patients who were given a combination of "orthodox" and Kenny treatments. They were excellent in eleven, good in ten, fair in three and poor in none of the twenty-four patients who were cared for entirely by the Kenny technique.

The writer concludes that immobilization by casts or splints is not necessary for the protection of weak muscles or to prevent deformities, and is actually harmful in prolonging muscle spasm and preventing the use of the Kenny routines.

Patients receiving the Kenny treatment are more comfortable, have better general health and nutrition, are more receptive to muscle training, have a superior morale, require a shorter period of bed rest and hospital care, and seem to have less residual paralysis and deformity than patients treated by older conventional methods. Bingham is of the opinion that the Kenny treatment is the treatment of choice in the acute stage of infantile paralysis.

Book Notices

AND THEY SHALL WALK. The life story of Sister Elizabeth Kenny. Written in collaboration with Martha Ostenso. Cloth. Pp. 281, with illustrations. Price $3.00. Dodd, Mead & Company, 432 Fourth Avenue, New York, 1943.

A book such as this is needed to permit Sister Kenny the opportunity of placing before the public her concepts and treatment of infantile paralysis in language the lay person can understand, unmarred by medically-couched verbiage. As brought out in the book, her experience as a graduate nurse in the Australian bush, in France during the first World War, and on the high seas in hospital ships, gave to Sister Kenny the background of ruggedness and perseverance which enabled her to battle courageously for the principles of treating poliomyelitis which she knew were successful clinically. It was during her experience in World War I that she was given the title "Sister." As she says, "On December 20, 1916, General Fetherstone, Director General of the Medical Services of the Australian Imperial Forces, promoted me from the rank of Staff Nurse—equivalent to Second Lieutenant—to that of Sister, which corresponds to the rank of First Lieutenant in the Army."

The story of her life apparently has not been garnished by the exaggerated and colorful wording commonly employed by professional writers who collaborate with authors.

In this, the fourth and latest book which she has written or collaborated in, Sister Kenny pours out the whole black story of the opposition of organized medicine to her revolutionary methods of treating poliomyelitis. THE JOURNAL commented editorially[1] on the "unfortunate mistake" on the part of many top-ranking M.D. orthopedists in Australia, England and even in the United States who refused to have anything to do with Sister Kenny. It also pointed out in the same editorial that doctors of osteopathy since at least as early as 1916 in their treatment of this crippling disease have included similar methods to those employed by Sister Kenny.

R. E. D.

BIOCHEMISTRY OF THE FATTY ACIDS: AND THEIR COMPOUNDS, THE LIPIDS. By W. R. Bloor, Professor Biochemistry and Pharmacology, The University of Rochester, Rochester, New York. Cloth. Pp. 387. Price $6.00. Reinhold Publishing Corporation, 330 West 42nd Street, New York City, 1943.

Opening with a simple definition of lipids, the author quickly proceeds to the intricacies of mixed glycerides. The chapters are long and serve the purpose of sections with summaries interspersed throughout each chapter. The book is essentially a review of the literature on the subject.

In the first chapter the procedure is given for the extraction of cholesterol, phospholipids and fatty acids from the tissue, together with their significance and analytical methods. An acquaintance with the techniques is assumed. It is suggested that cholesterol acts as a dialetic in transmission of nerve impulses and as an antihemolytic, and that choline, which may be a factor of vitamin B complex and is essential for the formation of acetylcholine, prevents the accumulation of cholesterol esters. It favors formation of phospholipids and is a barrier to the development of fatty liver. In this connection the author mentions the fact that section of the spinal cord at the sixth thoracic prevents the development of fatty liver.

A short paragraph is given to discussion of the chemical similarity of sterols. Members of the cyclopentanoperhydrophenanthrene group which includes bile acids, digitalis, sex hormones and adrenal substances are also discussed. A great deal more space could be devoted to their comparison and since it is pertinent to mention, it would seem advantageous to enlarge upon it.

In chapter two the digestion, absorption, transportation and deposit of lipids is described in detail.

In chapter three the ratio of the lipids in plasma and corpuscles of normal blood are compared for age, the reproduction cycle, after fat ingestion together with diurnal and seasonal variations, as well as in certain diseased states particularly cancer and anemia. The influence of hormones, vitamins and drugs and diseases on the deposit, mobilization and utilization of fatty acids and bases, neutral fats and alcohols is discussed at some length. The food fats appear to be stored in many instances with little change. The bacterial lipids receive considerable attention. There are some apparent contradictions in that on page two cholesterol is classified with the fats as a lipid, yet on page twenty-three the author states it is not related to fats chemically. Labeling the fat with deuterium or radioactive phosphorus as a means of identifying it in the tissue permits studies not heretofore possible. After reviewing the literature the author sums up lipid metabolism by quoting Mitchell, "The sum total of the evidence for the possibility of a conversion of fatty acids to sugar seems to be merely suggestive, certainly far from conclusive. On the other hand, there is no justification for a categorical denial that the conversion is possible. The verdict of 'not proven' is the most logical one to return." This quotation appears to express fairly accurately the contents of the book. He concludes by following lipids through secretions, with a good deal of attention to milk and eggs, and excre-

LEONARD V. STRONG, JR., D.O.

PAIN MECHANISMS. A Physiological Interpretation of Causalgia and Its Related States. By W. K. Livingston, M.D., Lieutenant Commander, M.C., U.S.N.R. Cloth. Pp. 259, with figures and drawings. Price $3.75. The Macmillan Company, New York, 1943.

Pain has been a subject of concern to physicians from the beginning. It might even be said that medicine evolved from a necessity for relieving pain. The mechanisms of pain have been a subject of inquiry for several generations and have had the attention of such men as Weir, Mitchell, Henry Head and Thomas Lewis. In the present volume, Livingston has set down his reflections on the cause and cure of pain. Writing in the first person, and from the standpoint of a neurosurgeon, he has confined himself largely to pain in the extremities. He clarifies terms familiar to the neurophysiologist that may be somewhat obscure to the general practitioner.

The first section of the book is devoted to the means by which pain is recognized as such, and is illustrated by such passages as "No one believes at present that the sensory nerves are merely passive conductors, and few people are of the opinion that because an increasing stimulus may result in a change of sensory experience from touch and pressure into pain, the same sensory unit has been responsible for both the touch and the pain," and " . . . different blocking agents . . . will cause fibers of different size to drop out of action in characteristic order."

The second section is limited to description and treatment of clinical conditions.

The third section, which he entitles "Interpretation," is essentially a continuation of section one and contains some very searching chapters on the components of sensory anatomy and physiology. He mentions in passing the same nodules present in myositis, which can be dissipated by massage, that were so carefully described by Llewellyn and Jones in "Fibrositis." Both refer to remote pain attributed to these nodules. In a short summary of several pages he says in the first paragraph that "This is a personal record of impressions . . . rather than settled convictions," but they are impressions worthy of serious study and are the result of such study by one equipped temperamentally and technically.

LEONARD V. STRONG, JR., D.O.

HOW TO PREPARE FOR MILITARY FITNESS. By Lt. Col. Francois D'Eliscu. Cloth. Pp. 216, with illustrations by Stephen J. Voorhies. Price $1.96. W. W. Norton & Company, Inc., 70 Fifth Avenue, New York, 1943.

Francois D'Eliscu became known to hosts of osteopathic physicians during the time he was connected with the Philadelphia College of Osteopathy. Into this small book he has packed an amazing amount of information written from a broad background of practical experience. *The Yank, the Army Weekly*, says of D'Eliscu that he is "one of the toughest men alive. Because of him, the Rangers (and eventually all American soldiers) actually know more about judo than the average Japanese!" Until he left to train overseas troops Colonel D'Eliscu was head of the Ranger

1. Duffell, R. E.: A Step Forward in Poliomyelitis Care. Jour. Am. Osteop. Assn., 1942 (Jan.) 41:234-237.

and Combat School, where he played an important part in training the Rangers who have since become famous. In civilian life he has trained Olympic swimming teams, been national vice-president of the Amateur Athletic Union of the United States, been a National Field Commissioner of the Boy Scouts of America, and taught physical education and coached athletic teams on this continent and in Hawaii for twenty years, most recently at Columbia University.

Although the book is what its name implies, yet it contains much other material, including more holds, throws, and counters than most books devoted solely to that subject; includes all the tumbling needed by parachuters and by regular soldiers who must leap from moving trucks and get under cover quickly; gives the essentials of war-time swimming, including information on breathing in oil-covered water, jumping from great heights, and using clothing as life buoys; tells of exercises and games which teach correct military ways of running, creeping and crawling. It is a veritable encyclopedia on physical fitness by one who knows whereof he speaks.

Recent newspaper accounts indicate that it is not only in close combat that D'Eliscu knows his way around. A *Chicago Tribune* correspondent in the Gilbert Islands reported on November 21: "At an advance command post near the scene of yesterday's slaughter, I met Lt. Col. Francois D'Eliscu of Columbia university, commander of the army's ranger training school, an observer. He displays proudly the rifle and cap taken from a Jap he killed last night while the Nip was drawing a bead on one of the officer's companions."

MANAGING YOUR MIND. By S. H. Kraines, M.D., Associate in Psychiatry, University of Illinois, College of Medicine; Assistant State Alienist, State of Illinois; Diplomate of American Board of Psychiatry and Neurology, and E. S. Thetford. Cloth. Pp. 374. Price $2.75. The Macmillan Company, 60 Fifth Ave., New York City, 1943.

This is a book written for the laity. It is intended for sufferers from neuroses as an aid in their recovery. Many volumes have come from the publishers with this idea in mind. This one is good; it presents the subject in an interesting style, free of technical terms and as personal as one could wish.

The theme of the work is that man can be master of his thinking if he will plan his life and act upon the plan. There must be a philosophy and code of values based upon reality and not upon learned immature reactions. According to the authors, if a problem has shown no physical basis upon examination by competent medical men it may be termed neurotic and treated accordingly. They mention the habit of nervous reactions. This must be weighed somewhat by osteopathic students for osteopathic philosophy teaches that man naturally inclines toward health if the obstacles to recovery are removed. The explanation of "habit" in neurotic behavior is really but an explanation that the authors cannot explain otherwise.

On the whole the book is sanely written and should be very useful in the treatment of emotionally ill patients. Physicians at large do not make as much use of books of this type as they should. This one can be recommended.

THOMAS J. MEYERS, D.O., F.A.C.N.

(Book Notices continued on ad p. 39)

State Boards

Connecticut

Examinations February 12, at New Haven. Applications will be received until January 29. Address State Board of Healing Arts, 250 Church St., New Haven 10.

Kansas

Examinations February 24-26, at the Jayhawk Hotel, Topeka. Applications should be filed 10 days prior to first meeting date. Address Robert A. Steen, Emporia.

Nebraska

E. Bernard Drost, North Platte, was appointed to the board on October 26 for a term of 3 years.

New Mexico

Basic science examinations February 7. Applications should be filed by January 24. Address Pia Marie Joerger, secretary-treasurer, c/o Secretary of State Office, Santa Fe.

L. C. Boatman, Santa Fe, has been appointed to the basic science board for 5 years.

Oregon

Basic science examinations March 4, Room B (third floor), Main Library, Portland. Applications should be filed by noon, February 16. Address Mr. Charles D. Byrne, secretary, State Board of Higher Education, Eugene.

Reciprocity on the basis of examinations only, has been established with the basic science examining boards of Minnesota, Wisconsin, Iowa, Colorado, South Dakota and Tennessee.

Rhode Island

Basic science examinations February 16. Applications should be filed prior to February 1. Address Thomas B. Casey, Chief of the Division of Examiners, Providence.

South Dakota

Examinations February 1, 2, at Sioux Falls. Applications will be received until February 1. Address James H. Cheney, secy.-treas., Paulton Bldg., Room 207, Sioux Falls.

Wisconsin

The State Board of Medical Examiners now requires an oral examination by the entire board of all candidates, M.D.'s and D.O.'s, for license by reciprocity from all states.

Wyoming

Examinations February 7, 8, Capitol Bldg., Cheyenne. Applications should be filed two weeks prior to examination. Address M. C. Keith, M.D., secretary, State Board of Medical Examiners, Capitol Bldg., Cheyenne.

Meetings

American Osteopathic Association. Forty-Eighth Annual Meeting, Palmer House, Chicago, July 14 to 18 inclusive. Program Chairman, Paul van B. Allen, Indianapolis.

Eastern Osteopathic Association, Pennsylvania Hotel, New York, April 1, 2.
Maine, Poland Springs, June.
Massachusetts, Boston, January 15, 16.
Vermont, October. Program chairman, Eva W. Magoon Somerville, St. Johnsbury.
Washington, Olympia.
West Virginia, Clarksburg.

OFFICIAL AND AFFILIATED ORGANIZATIONS

CALIFORNIA

Citrus Belt

A meeting was held at Fontana on October 12, at which Charles Atkins, Pasadena, and Mr. Thomas Schumacher, executive secretary of the California Osteopathic Association, were the speakers.

At the meeting at Fontana, November 11, William F. Hewitt, Jr., Ph.D., Los Angeles, spoke.

At the meeting on December 9, the scheduled speaker was Mr. Ray Deutcher, director of rehabilitation of the physically handicapped in the Riverside, San Bernardino and Imperial counties district.

ILLINOIS

First District

A meeting was held December 2, at Chicago. An address was given by W. Ballentine Henley, president of the College of Osteopathic Physicians and Surgeons of Los Angeles; and Martin Beilke, Chicago, spoke on "The Short Leg."

Chicago South Side

On December 2, a general discussion on "Pneumonia" was held.

Fourth District

At the meeting on November 4, at Bloomington, Jack H. Grant, Chicago, spoke on "Diagnosis from the X-Ray Standpoint."

Seventh District

On November 4 at Streator, Robert H. Nichols, Boston, Mass., was scheduled to speak on "Coronary Occlusion and Angina Pectoris."

INDIANA

State Society

Randall Bass, Indianapolis, was reappointed legislative chairman instead of Walter S. Grow, Indianapolis, as stated in the December JOURNAL. Dr. Grow is co-chairman.

Fourth (Northern) District

On November 17, at South Bend, the principal speaker was R. P. Ramsdell, Laporte, who demonstrated his method of sinus drainage.

IOWA

State Society

L. A. Nowlin, Davenport, has been appointed chairman of a committee to study socialized medicine.

First District

At the meeting on October 4, at Cedar Rapids, the following officers were elected: President, Dale S. House, Dubuque; vice president, C. K. Risser, Maquoketa; secretary-treasurer, Robert F. Herrick, Clinton, (re-elected).

Mary E. Golden and Byron L. Cash, both of Des Moines, addressed the meeting.

Second District

On October 10, the following officers were elected: President, Norman D. Weir, Woodbine; vice president, W. P. Chandler, Jr., Persia; secretary-treasurer, Ronald K. Woods, Shelby.

Boone-Story County

At the meeting on November 12, at Ames, the following officers were elected: President, Ralph Westfall, Boone; vice president, E. S. Honsinger, Ames; secretary-treasurer, H. L. Gulden, Ames.

B. E. Laycock, Maxwell, spoke on "Tropical Diseases and What We Can Expect After the War;" Dr. Gulden on "Fractures;" and Dr. Westfall on "The Injection Treatment of Hemorrhoids."

O. E. Owen, dean of the Des Moines Still College of Osteopathy, was scheduled to speak on "Tropical Diseases" at the meeting to be held December 17.

Central

On October 14, at Hubbard, E. F. Leininger, Des Moines, discussed the management of fractures.

Polk County

On November 11, at Des Moines, Wesley H. Glantz, Des Moines, spoke on "Injection Treatment of Varicose Veins."

Tri-County

At the meeting on October 31, at Earlham, the guest speaker was Howard A. Graney, Des Moines.

KANSAS

Arkansas Valley

On November 11, at Larned, B. B. Bahme, Dickinson, N. D., spoke on "The Injection Treatment for Chronic Recurring Sacroiliac Lesions."

LOUISIANA

State Society

Committee chairmen are: membership, Melbert R. Higgins, Lafayette; professional education, R. H. Walton, New Orleans; ethics and vocational guidance, A. E. Stanton, Crowley; publicity and professional and public welfare, Carl E. Warden, Lake Charles; statistics, James A. Keller, Jennings; legislation, James R. Kidwell, Baton Rouge.

MASSACHUSETTS

Southeastern (Fourth District)

The officers are: President, W. A. Jeffrey, New Bedford; vice president, Wanda Dammon, Fairhaven (re-elected); secretary-treasurer, Thomas Berwick, New Bedford.

The meeting on October 19, at New Bedford, was addressed by Hazel Axtell, Providence, R. I.

At the meeting on November 10, at New Bedford, Dr. Jeffrey spoke on "Thyroid Disease."

A meeting was scheduled for December 8, at New Bedford, with Harrie L. Davenport, Jr., Providence, R. I., as the speaker, and his subject "X-Ray in Osteopathic Practice."

Worcester

A meeting was scheduled for December 8, Harold P. Frost, Worcester, was to speak on "Rectal Diseases."

MAINE

Knox-Lincoln-Waldo (Tri-County)

At the meeting on October 8, at Rockland, the guest speakers were Edward G. Drew, Waterville, and Earl H. Gedney, Bangor.

MICHIGAN

Capital

The officers are: President, Theodore H. Kaiser, Lansing; vice president, H. G. Porter, Lansing; secretary-treasurer, Frederick H. Taylor, East Lansing.

Central

A meeting was held at Stanton on December 2. Harold R. Seelye, Stanton, read a paper on "Practice of Obstetrics in the Small Hospital."

A meeting is scheduled for January 6 at Stanton.

Saginaw Valley

The officers are: President, Albert J. Nitz, Saginaw; vice president, Arthur A. Speir, Merrill; secretary, Geoffrey T. Lawrence, St. Charles; treasurer, George Meyer, Reese, (re-elected).

Committee chairmen are: membership, Harry R. Schmitt, Bay City; hospitals, Dr. Lawrence; statistics, C. W. Bakeman, Midland; vocational guidance, Roy Fisher, Midland; public health, A. H. Fuller, Bridgeport; industrial and institutional service, John M. O'Conner, Esserville; public relations, H. C. Moore, Bay City; ethics, Manuel Goldberger; clinics, William L. Pettycrew; convention program and arrangements, Chester S. Chicky; legislation, F. B. Wolfe; women's and child welfare, W. Dale Jamison, all of Saginaw.

South Central

The officers are: President, Alan R. Becker, Jackson; vice president, Ronald W. Huling, Battle Creek; secretary-treasurer, Wayne A. Size, Concord, (re-elected).

MISSOURI

Central

The officers are: President, A. B. Cooter, Boonville; vice president, Albert H. Domann, Auxvasse; secretary-treasurer, Glenn R. Oney, Bowling Green.

Committee chairmen are: membership, Benjamin S. Jolly, Moberly; ethics, Dr. Domann; hospitals, David A. Squires, Fulton; clinics, Harold I. Nesheim, Mexico; statistics, T. Raymond Turner, Madison; convention program, M. A. Jones, Boonville; convention arrangements, R. W. Van Wyngarden, Mexico; legislation, R. H. Baize, Laddonia; vocational guidance, Lloyd E. Hutchins, Fulton; public health, J. E. Knudsen, Jonesburg; industrial and institutional service, James R. Dougherty, Vandalia; public relations, Dr. Oney; student recruiting, H. A. Gorrell, Mexico; radio, Walter E. Sparks, Columbia.

At a meeting held November 18, at Mexico, the speakers were Drs. Cooter, Turner and Van Wyngarden.

Jackson County

On November 16, at Kansas City, the speaker was Mr. Frederick A. Mote, world traveler and lecturer, who discussed Japan, China and the islands of the Pacific.

Macon County

At the meeting on November 1, at LaPlata, Wallace M. Pearson, Kirksville, discussed and showed x-rays of low-back disorders.

Southeast

A meeting was held November 14, at Sikeston.

NEW YORK

State Society

The officers were named in the November JOURNAL. The following committee chairmen have been appointed: membership, Robert F. Cole, Geneva; professional education, Howard B. Herdeg, Buffalo; hospitals, William E. Kaufmann, Syracuse; ethics, M. Lawrence Elwell, Rochester; student selection, Harold C. West, Yonkers; public health, Francis J. Beall, Jr., Syracuse; workmen's compensation, Melvin B. Hasbrouck, Albany; department of public affairs, Alvah H. Leeds, Yonkers; legislation, John L. Brookman, Albany; department of professional affairs, Merritt C. Vaughan, Rochester; department of national affairs, Alexander Levitt, Brooklyn.

OHIO

Fifth District

Orin O. Bashline, Grove City, Pa., addressed the meeting on November 18 at Dayton.

PENNSYLVANIA

Third District

The committee chairmen are: ethics, Wm. H. Behringer, Jr.; hospitals, Michael Blackstone; statistics, John Leech; legislation, C. R. Heard; vocational guidance and program, Dr. Behringer, all of Allentown; public health, Frank A. Biedler, Reading.

A meeting was scheduled for November 11, at Allentown, with James Madison Eaton, Upper Darby, as the speaker, and his subject "Disturbances of the Growth of Bones in Children."

Sixth District

The following officers were elected on August 18: President, Warfield A. B. Martin, Milton; vice president, Harry E. Davis, Lewisburg; secretary-treasurer, Dudley B. Turner, Jr., Williamsport.

The committee chairmen are: membership, Sidney W. Cook, Towanda; hospitals, Charles S. W. Rickolt, Muncy; program, Clarence H. Couch, Troy; legislation, Dr. Davis; vocational guidance, C. Howard Bowman, Williamsport; industrial and institutional service, ethics, and public relations, Dr. Turner; statistics, Robert H. Abbott, Muncy.

Eighth

The following officers were elected on November 30: Chairman, Roy G. Dorrance, Jr., Pittsburgh; vice chairman, Fred C. Perkins, Uniontown; secretary, Ruth A. Franz, Pittsburgh; treasurer, Howard G. McClelland, Bellevue, (re-elected).

TENNESSEE

State Society

The following officers were elected September 16: President, Stanley C. Pettit, Cleveland; vice presidents: east, J. Allan Johnson, Bristol; middle, J. R. Shakleford, Jr., Nashville; west, Lewis Daniel Elliston, Covington; secretary-treasurer, Helen A. Terhuwen, Nashville, (re-elected).

The committee chairmen are: legislation, L. Dale Chesemore, Paris; veterans' affairs, Fred L. Mitchell, Chattanooga; social security, public health, and clinics, Dr. Terhuwen; industrial and institutional service, George A. Bradfute, Knoxville; membership, Fred H. Butin, Memphis; vocational guidance, Alberta Johnson, Knoxville; editorial contact, radio, and publicity, C. L. Baker, Memphis; labor contact, J. C. Bolin, Chattanooga; censorship, George W. Stevenson, Springfield; education, Ernest L. Bechtol, Clinton; convention arrangements, Mary B. Davis, Memphis.

WASHINGTON

King County

The following are the officers: President, Delbert F. Johnson (re-elected); vice president, John H. Thorp; secretary, George S. Fuller (re-elected); treasurer, A. B. Cunningham (re-elected), all of Seattle.

The committee chairmen are: membership and hospitals, Herbert G. Bauer; legislation, Dr. Cunningham; industrial and institutional service, Clarence H. Baker; professional development, Joseph G. Aiken, all of Seattle.

WEST VIRGINIA

Parkersburg

A meeting was held on November 11 at Parkersburg.

Extracts

WARTIME DEVELOPMENTS IN MEDICAL EDUCATION

Developments of major importance in medical education have occurred since the entry of the United States in the war as reviewed in the *Journal of the American Medical Association, Education Number,* August 14, 1943, under the title "Medical Education in the United States and Canada." A resumé of these developments follows:

ACCELERATED PROGRAMS

Even before Pearl Harbor many of the schools of medicine had increased their enrollments and had adopted accelerated programs. At present virtually all of the 76 medical schools in the United States are operating on accelerated programs, admitting new classes approximately every 9 months and condensing the traditional 4 academic years of the medical curriculum into 3 calendar years, without reducing the total classroom, laboratory, and clinical hours, by eliminating summer vacations.

The only exceptions to this are the University of Michigan Medical School, which is on a full accelerated program, but admits freshman students only once a year; the Woman's Medical College of Pennsylvania, which is on an accelerated program for the junior and senior years only, and admits freshman students once a year; the University of Tennessee College of Medicine, which has a full accelerated program and admits students approximately every 3 months; and the schools of basic medical sciences, all of which have accelerated their work and are admitting new students approximately every 9 months.

MEDICAL SCHOOL ENROLLMENTS

The Army Specialized Training Program and the Navy V-12 Program had been installed at all schools of medicine by June 1943, with the exception that one school had no Army students and three had no Navy students. Approximately 20,000 medical students were enrolled in the Army and Navy units at that time; 15,000 in Army units and 5,000 in Navy units. The total number of medical students, including Army, Navy, and civilian, at the time the Medical Association's Report was issued was 23,204. This was an increase of 573, or 2.5 per cent over the number enrolled in the schools in the academic session completed before the publication of the report. There is a tendency toward annual increases in enrollments.

WOMEN IN MEDICINE

During the academic year 1942-43, there were 1,150 women enrolled in medical schools in the United States. This represented 5.1 per cent of the whole number of students. The same year there were 271 women graduates, or 4.6 per cent of the total number. These figures represent slight decreases from the previous year of women enrolled in and the number graduating from medical schools. The entire increase in enrollment in medical schools is therefore in the number of men students.

Recent changes in Army regulations permit the commissioning of women physicians, but at present women students are not included in the Army or Navy medical or premedical program. Women physicians, however, are making a contribution to the war effort through the woman's division of the Procurement and Assignment Service, by cooperating in the relocation of physicians, and by carrying heavier loads than before.

PREMEDICAL REQUIREMENTS

The Army and Navy premedical curriculum of two years was formulated by the Council on Medical Education and Hospitals of the American Medical Association, and therefore meets the minimum requirements for approved medical schools, both as regards the total work and the coverage of specific subjects. In 1941-42 all but eight schools required for admission from three years of college work to a degree,

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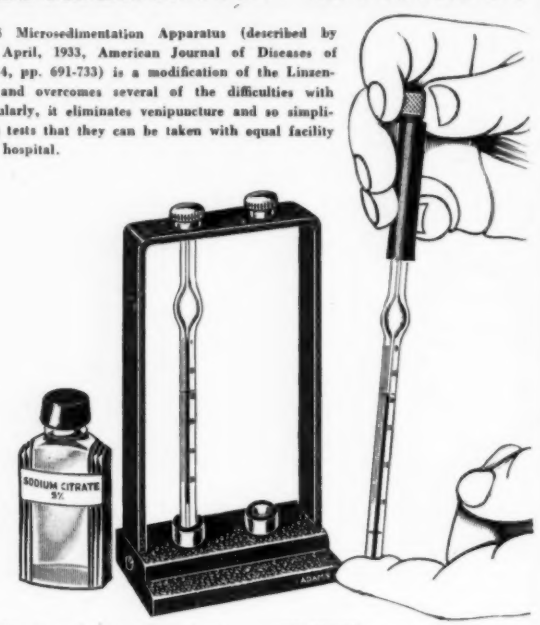

PROCEDURE . . . Attach suction apparatus to a pipette, draw up 5% citrate solution to the first circular mark on the pipette. Puncture the finger tip and draw up blood until the combined column reaches the second circular mark. With the suction apparatus the citrated blood is carefully mixed by bringing it up and down into the bulb. After mixing, the top of the column is brought down to the zero point on the scale. The pipette is then set into the rack. After one hour the millimeter drop is read directly from the scale on the pipette. Same procedure can be used when the sample is taken at the bedside, in which case it can be read after remixing up to six hours after the sample was taken.

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and in that year the freshmen entering medical schools with the minimum two-year requirement constituted but 1.2 per cent of the total number of entering students. At present the minimum two-year requirement is in effect for all students in the A. S. T. P. and the V-12 programs. These students constitute about 87 per cent of the total enrollment of the schools in the United States and Canada. The requirement is in effect in 59 schools, for both military and civilian students. For civilian students two schools (both in Canada) require a degree; 20, three years of college work; and five, variable amounts of college work in excess of two years.

LICENSURE UNDER THE ACCELERATED PROGRAM

All of the States, the District of Columbia, Alaska, Hawaii, and Puerto Rico, have adjusted their licensure legislation or practices, where necessary, to permit graduates under the accelerated medical program to be admitted to licensure, at least for the duration of the emergency. The legislation in all the States, the District, and the outlying areas makes it possible for students with two years of premedical training to become eligible for admission to licensure on completion of the medical curriculum.

The Army Specialized Training Program for premedical students calls for a total of 15 calendar months of work, and the Navy V-12 program for 18 calendar months. The work in both programs is continuous throughout the year, with the students carrying more than the normal peacetime load per term. As both programs provide for work in excess of the 60 semester hours constituting the normal two-year premedical requirement, the programs offer no licensure difficulties.

THE SUPPLY OF PHYSICIANS

The report of the Council on Medical Education and Hospitals predicts that in the years 1943 and 1944 the number of medical graduates will far exceed the number in the past history of the country. From July 1, 1942, to the opening of the first academic sessions in 1943, which were anywhere from January to July, the schools graduated 5,223.

Between the opening of the first academic session in 1943 and January 1945, the council estimates that 10,880 students will graduate. Adding this number to the 5,223 graduated from July 1, 1942, to the opening academic sessions in 1943, the number is 16,112 students who will have graduated in a 30-month period, July 1, 1942, to January 1, 1945, or an average of 6,445 graduates per calendar year. This number of graduates for the 66 medical schools in the United States exceeds the number ever previously graduated in one year, even in 1905, when the 160 schools then in existence graduated 5,606.

NEW SUBJECTS IN MEDICAL CURRICULUM

Among the wartime developments in medical education the report mentions the addition or the stressing in the curriculum of subjects of war significance—tropical medicine and parasitology, first aid, shock and blood substitutes, burns, and war wounds, venereal diseases, aviation physiology and medicine, industrial medicine and public health, chemical warfare, military medicine, and chemotherapy. Many of these involve "material of basis scientific importance," and will probably justify their inclusion in the medical school program after the war.

FACULTY MEMBERS IN WAR SERVICE

The accelerated program and the larger enrollments have greatly increased the demands on medical school faculties, which at the same time have been seriously reduced in numbers. By July 1, 1943, the 66 medical schools and the ten schools of basic medical sciences had contributed a total of 5,637 of their faculty members to the armed forces. Although many of the teachers now in active service were on a part-time basis, their loss has been seriously felt.

Furthermore, in addition to the loss to military service, the faculties have been further reduced in numbers through the drawing off from teaching of some of their members to engage in war research. In 21 of the 76 medical

schools, 130 faculty members, practically all of them full-time teachers, are devoting all their time to war research. Others are devoting a large part of their time to it.

ADDITIONAL MEDICAL SCHOOL FACILITIES

The war emergency has occasioned the need for additional medical school facilities. Growing out of this need doubtless is the removal of the Baylor University School of Medicine from Dallas to Houston, Tex., where it will have increased clinical facilities and, through generous grants made by the M. D. Anderson Foundation and the Houston Chamber of Commerce, will operate, and following the war will construct buildings for its preclinical work. At present and for the duration of the war the work is being conducted in temporary quarters.

To take the place of Baylor University School of Medicine a new school has been organized in Dallas, financed by the Southwestern Medical Foundation and the Dallas Chamber of Commerce. This school is also occupying temporary quarters and will construct its own buildings following the war. The school has the advantage of starting out with some of its faculty already secured from those members of the Baylor school who elected to remain in Dallas. Likewise, it has many of the former Baylor students.

A new school of medicine is projected in Florida. An act was passed by the legislature of the State on June 14, 1943, to create a State university to be known as the University of South Florida, whose primary purpose shall be a school of medicine, a school of pharmacy, and a school of dentistry.

OTHER DEVELOPMENTS TOWARD INCREASED FACILITIES

Another development of importance is the tendency toward expanding the schools of the basic medical sciences into full four-year medical schools. Bowman Gray School of Medicine of Wake Forest College, N. C., has added both junior and senior years to its course and will graduate its first class in December, 1943. The School of Medicine of the University of Utah has started a junior class which will graduate in August, 1944. Provision has been made in Alabama, which now has a school of basic medical sciences, for the establishment of a four-year school. One million dollars has been appropriated for buildings and equipment, and $366,000 for annual maintenance. Two other States have considered the expansion of their two-year schools.

Through a cooperative arrangement entered into between the West Virginia University School of Medicine and the Medical College of Virginia, 15 to 20 students completing the work of the second year in the West Virginia school will transfer to the Medical College of Virginia at Richmond for the completion of the four-year curriculum, effective January, 1944. This experiment has significance for other schools of medical sciences, which are finding it increasingly difficult to transfer their students to four-year schools having sufficient facilities to provide for other students than their own.

INTERDEPARTMENTAL COLLABORATION

Another development, taking place within the medical schools themselves, and which will affect the schools of the basic medical sciences, is the effort to secure closer collaboration among the various fields of medicine. Several schools have appointed faculty committees to review the curriculum and to make recommendations looking toward this end.

These developments show two tendencies: (1) To draw less sharply the demarcation between "preclinical" and "clinical" medical study, and to view instruction as a four-year unit rather than two units of two years each; and (2) to increase collaboration between departments in the presentation of related material, with a view to eliminating needless repetition and substituting planned, desirable repetition of instruction in a field that requires the resources of several departments; in other words, to view a given system or organ as a complex of problems rather than as a subject for study in several different departments.—*Education for Victory*, November 1, 1943.

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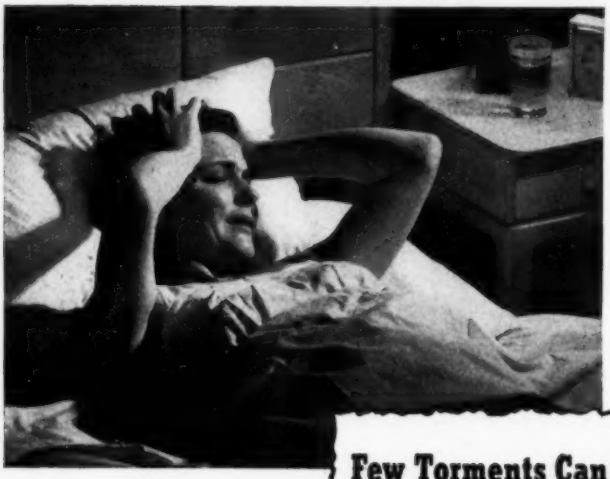

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THE WAR AND THE DISTRIBUTION OF PHYSICIANS.

By G. St. J. Perrott, *Chief, Division of Public Health Methods,* and Burnet M. Davis, *Passed Assistant Surgeon (R), United States Public Health Service.*

What effect is the war having on the number and distribution of civilian physicians? In time of peace, medical care may be regarded as a necessity largely for humanitarian reasons; in total war it concerns us primarily because of the importance of maintaining maximum production with limited manpower. It is estimated that industry loses the equivalent of 1,000,000 employees' work every day because of illness and injury; how much food production is lost through illness among agricultural workers is not known.

It must be admitted at the outset that there is no simple relationship between the number of physicans in a community and the prevalence of disability-producing disease in that community. It has been shown that the number of physicans' services per capita varies greatly in different States, and that even when there are relatively few physicians in a community some of them may not be working to capacity (1). We have no quantitative measure of the effect of physicans' services on disabling morbidity. It is generally accepted, however, that if the availability of physicians' services falls below a critical level, health, morale, and productivity suffer. It is not the purpose of this paper to define what level may be considered critical, or, indeed, how this level can be measured. The only readily applied index of such a level is the ratio of physicians to persons, or the more commonly used reciprocal, the number of persons per physician in the area under consideration. It is to be emphasized that this index is a crude one, since a high ratio of physicians to population does not guarantee a high level of services to all segments of the population. On the other hand, the total amount of service available is necessarily limited by the number of persons qualified to provide that service. The ratio may, therefore, be used as an index of the maximum amount of medical service potentially available to a community.

It is well known that the distribution of physicians, in terms of persons per physician, has shown great variation among the several States for many years. It is also known that this variation has a high positive correlation with State variation in per capita income and degree of urbanization, and with the ratios of dentists, nurses, and hospital beds to population.

The number of physicians in the United States, or in any of its subdivisions, is dependent on a dynamic rather than a static equilibrium. Physicians are continually being removed from practice by death and retirement and are being replaced by new additions to the profession coming out of the medical schools. It has been shown that the changes occurring in the number of physicians in the several States over a period of years have been due chiefly to the relationship existing between deaths and acquisition of new graduates by each State; the net effect of interstate migration has been very small. The trend during the past 20 years has been for the States rich in physicians to become richer and the poor, poorer, largely because of the preference of new graduates for location in the medically wealthy States (2).

The obvious effect of the war on our medical manpower has been the withdrawal of about one-third of our active practitioners. Other less obvious factors are also disturbing the equilibrium and are thus affecting the number and distribution of physicians. If the war should end within a year and if demobilization and resumption of peacetime medical education should be effected immediately, these factors would be of but slight importance, for their effect is cumulative. How long the war will last we do not venture to predict, but it appears evident from the present med-

[1]From the Division of Public Health Methods, National Institute of Health.

ical training program that the Army and Navy expect to require large numbers of medical officers for a considerable number of years.

What changes have already taken place in the medical manpower picture, and what further changes may we expect to take place at the National and State levels during the next few years? To help answer these questions it is possible to make estimates by applying vital statistics, announced policies of recruitment and of medical education, and knowledge of well-established trends to available pre-war data on the number and distribution of physicians. Such estimates have been prepared and are herewith presented, carried ahead to January 1, 1950. They are, of course, subject to errors inherent in all predictions. Nevertheless, it is believed that these estimates are sufficiently accurate to demonstrate certain significant trends.

THE NATIONAL PICTURE

A summary of the national picture is shown graphically in figure 1. The curves are based on calculations as of January 1, 1942, and as of dates at subsequent 2-year intervals, by a method based on data and assumptions described in the appendix. It is evident from figure 1 that the decrease in the number of physicians is extremely rapid during the present 2-year interval, falling to 85,000 by the end of this year. Nearly nine-tenths of this decrease is due to recruitment by the armed services. The rate of recruitment has, of course, not been constant; the straight line merely represents the average rate for the 2-year interval. After the end of 1943, it is anticipated that recruitment of practicing physicians will virtually cease and that the armed services will obtain the additional medical officers needed from among the new physicians completing their education.

Since the services expect to take 80 per cent of all medical graduates, the number entering civilian practice will no longer fully replace those who die or retire, so that a net annual loss of about 2,100 is shown by the curve after January 1, 1944. This will leave approximately 72,000 physicians in practice by January 1, 1950.

Two hypothetical curves are also shown on figure 1 for comparison with the predicted curve. The dotted line shows the number of physicians required to provide a national average ratio of 1,500 persons per physician, a level which appears to have been generally accepted as the wartime minimum for civilian safety (3). This curve falls during the current period because building up the Army and Navy is reducing our civilian population, but after the end of this year, when inductions diminish in

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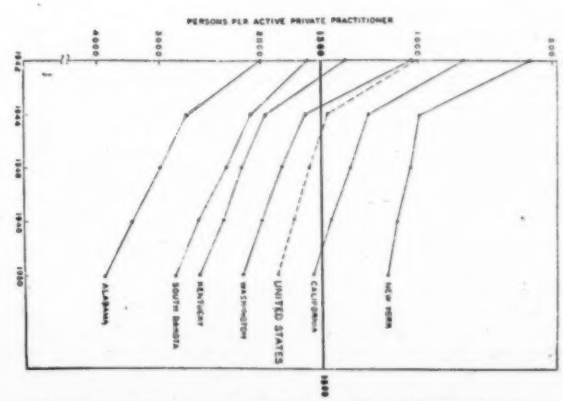

Figure 1.—Active private practitioners, United States, 1942-50.

PSYCHIC CONSTIPATION

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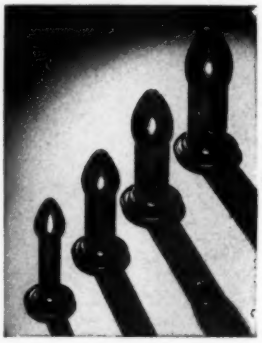

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number, the civilian population will begin to increase again. It is seen that the solid and dotted curves cross early in 1944; that is, the national ratio then becomes 1,500 persons per physician and thereafter grows progressively worse. The second hypothetical curve, the broken line, shows the course of events if no new graduates were to enter civilian practice. Comparison of this curve with the solid line gives an idea of the contribution toward maintaining the 1 to 1,500 ratio which will be made by the 20 per cent of the new graduates who will become civilian practitioners.

Thus, it is evident that the present military procurement objectives for medical officers, accompanied by a continuation of the previously existing and inevitable death rate, is causing a notable attrition in medical manpower which will become progressively more serious until by 1950 the country will be more than 15,000 physicians short of the number required to maintain the 1,500 persons-per-physician ratio. The crude index of the ratio actually underestimates the diminution in civilian medical services, since there is much evidence that the older physicians remaining in practice do not and cannot carry as heavy a work load as do the physicians under 45 years of age (1).

THE STATE PICTURE

As with the pre-war situation, the national average figures for recruitment and attrition of the medical profession conceal wide variations among the States. Any consideration of the effect of the war on the supply of physicians must give attention to data on the State and local situations. Local data must await further local studies, but at the State level sufficient data are available so that estimates may be made which are comparable to those for the country as a whole.

Figure 2 shows the change in the ratios of persons per physican in six selected States,[2] with the United States average included for comparison. To enable comparison of the rates of increase in the number of persons per physician the ratios have been charted on a logarithmic scale; the slope of each curve, therefore, represents the percentage change in the ratio during each 2-year interval.

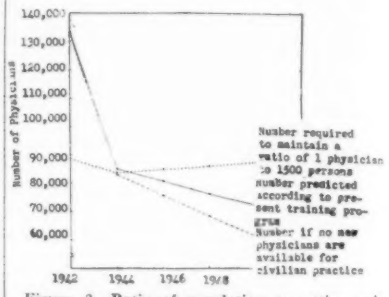

Figure 2.—Ratio of population to active private practitioners, United States and selected States, 1942-50.

Two trends are brought out by this chart. First, the initial drop, due to recruitment, is steeper in the upper curves, and second, the subsequent slower fall, due to unreplaced losses from the profession, is steeper in the lower curves. The explanation of these observations is not difficult.

Recruitment has to some extent been controlled by the quotas set for each State by the Procurement and Assignment Service in June, 1942. These quotas were based on the premise that physicians could be spared from each State in inverse proportion to the number of persons per physician in that State. For a number of reasons these quotas had not been exactly met up to the date of the last figures available, but their existence unquestionably slowed up recruitment in the States which were relatively poor in number of physicians.

The more rapid attrition after 1944 seen in the poorer States is accounted for by two factors. First, the bulk of young physicians entering practice has in the past gone to the wealthier

[2]See appendix for method of selection.

States and it is assumed that the small number not going into service will continue to follow approximately the distribution which occurred in the last 2 years before Pearl Harbor. Figure 3 brings out the unevenness of settlement of new physicians: For example, New York, with about 10 per cent of the country's population, gets nearly 18 per cent of the new physicians, while Alabama, with over 2 per cent of the population, gets only one-third of a per cent of the physicians. The second reason arises from the fact that the first factor has been operating for so many years that those States which now are receiving the fewest new physicians also tend to have the highest proportions of old physicians, as is shown graphically in figure 4. The death rate among the medical profession is, therefore, highest in these same States.

It is often said that war accelerates previously existing socio-economic trends. This would appear to be particularly true of the distribution of physicians, except where, as in the case of the State recruitment quotas, artificial controls have been established to combat existing trends. By reducing the supply of young physicians to about 30 per cent of its former size,[2] while leaving the death rate unchanged, the war has greatly increased the rate at which the medically poor States are becoming poorer.

Returning to figure 2, it will be noted that four of the six States start above the 1 to 1,500 line and all but one fall below it by 1950. It is evident that the two most favored States will still be better off in 1950 than the two poorest States were in 1942.

Of more immediate concern is the situation which will exist by January 1, 1944. Figure 2 shows the rapid changes in the ratios for the six selected States. What the recruitment during the 2 years 1942 and 1943 means in terms of all the States is shown in figure 5. Before recruitment only six States, with 11,500,000 population, had more than 1,500 persons per physician. By January, 1944, with the national ratio still slightly better than the 1,500 level, no less than 28 States, with 514,500,000 of our 125,500,000 civilians, will have more than 1,500 persons per physician. In seven of these, with 13,500,000 population, the ratio will be more than 2,000 persons per physician.

It seems probable that the statistical predictions made for State ratios underestimate the trend toward concentration of physicians in the richer States. There is reason to believe

[2]While the armed forces expect to take 80 per cnt of new graduates, the wartime increase in medical school output brings the number available for civilians up to about 30 per cent of the pre-war level.

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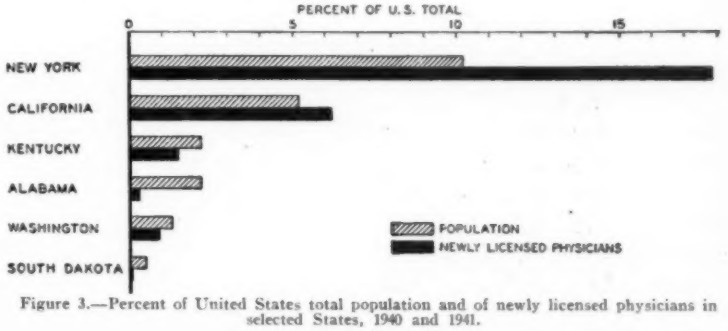

Figure 3.—Percent of United States total population and of newly licensed physicians in selected States, 1940 and 1941.

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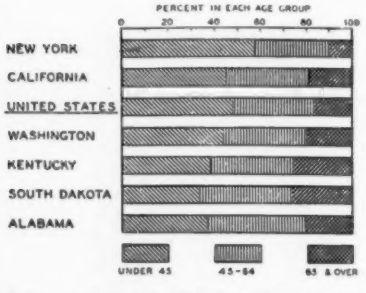

Figure 4.—Age distribution of physicians in the United States and selected States, 1942.

that the high consumer demand for medical services in these States will attract physicians from the poorer States to fill vacancies left by those going into military service. Since no quantitative data on this point are available, no correction has been made for this factor. Whatever uncontrolled migration of physicians occurs, however, may be expected to be in a direction which will exaggerate the tendency demonstrated.

The computed State ratios also underestimate the potential seriousness of the medical care situation for another reason which must be kept in mind. Just as the national ratio conceals variations among the several States, so do the State ratios conceal as wide, or even wider variations at local community levels, where medical service is actually obtained by the patient (4, 5). It seems probable that the same factors which are tending to concentrate physicians in the wealthier States will also tend to cause a shift of practitioners to the urban and wealthy areas within individual States. Data are not available, however, on which to base predictions at local levels.

DISCUSSION

The purpose of presenting these estimates is to draw attention to two points which have received relatively little consideration in discussions of medical manpower: First, the very considerable annual decrease in the number of civilian physicians which will persist even after recruitment has ceased, and second, the wide and ever widening variation in State levels which is concealed by the national average ratio of population to physicians.

If the much quoted ratio of one physician per 1,500 civilians is accepted as a minimum national average, the trend demonstrated for the national level constitutes a threat to adequate medical service and, therefore, to maximum war production. An even greater threat is presented by the trend shown for State levels and implied for localities. If the output of our medical schools cannot be further increased, and as long as the requirements of the armed services remain at their present level of one medical officer per approximately 155 men, the net annual decrease in our civilian medical manpower would appear to be inevitable. On the other hand, the increasing maldistribution of physicians may be attacked through control of the initial locations and of the migration of civilian physicians. Establishment of effective measures along these lines could do much to lessen the severity of developing State and local shortages.

SUMMARY

Estimates are submitted of the number of physicians who will remain in civilian practice in the United States and in selected States as of January 1, 1942, and at 2-year intervals thereafter up to 1950.

It is shown that the national average number of persons per physician will reach 1,500 early in 1944 and will continue to rise at a considerable rate because deaths and retirements are no longer being fully replaced by new additions to the profession. It is further shown that the rate of attrition will tend to be most severe in the States which were medically poor before the war, since these States generally have a high proportion of older physicians and receive an unduly low proportion of new medical graduates. Twenty-eight

States, with a combined population of 54,500,000, are expected to have more than 1,500 persons per physician by January 1, 1944, and seven of these, with 13,500,000 population, will have more than 2,000.

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(3) Hearings before a subcommittee (Pepper Committee) of the Committee on Education and Labor of the United States Senate, Seventy-seventh Congress, Second Session, on S. Res. 291, Part 2, p. 662. U. S. Government Printing Office, Washington, 1943.

(4) Pickens, M. I.: The effects of the war on the medical service in 38 North Carolina counties with limited medical personnel. North Carolina Med. J., 3: 570-571 (October, 1942).

(5) Ciocco, A., and Altman, I.: The withdrawal of physicians in private practice from Georgia. J. Med. Assoc., Georgia, 32: 104-107 (April, 1943).

APPENDIX

SOURCES OF DATA

1. Census of Physicians of the Committee on Medical Preparedness of the American Medical Association, tabulated by the United States Public Health Service, for total physicians, full-time appointments, and age distribution by States.

2. Hospital Number, 1942, Journal of the American Medical Association, for interns and residents by States.

3. Educational Number, 1942, Journal of the American Medical Association, for present and anticipated number of new medical graduates.

4. State Board Numbers, 1941 and 1942, Journal of the American Medical Association, for distribution of newly licensed physicians by States.

5. Procurement and Assignment Service, War Manpower Commission, for unpublished data on recruitment of physicians by States.

6. United States Bureau of the Census estimates for population distribution by States, 1943.

7. Unpublished material, Division of Public Health Methods, National Institute of Health, United States Public Health Service, for age-specific death rates and age-specific retirement percentages for physicians.

ASSUMPTIONS

In order to make estimates of the numbers of physicians at future dates it has been assumed:

1. That the procurement objectives up to January 1, 1944, will be met from the several States in the proportion that each State had contributed up to the date of the last available data, April 30, 1943.

2. That all new medical graduates will enter the armed services on com-

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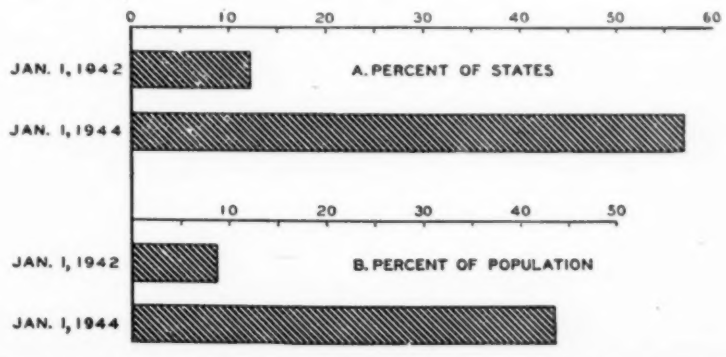

Figure 5.—A. Percent of States with more than 1,500 persons per active private practitioner. B. Percent of United States population in States with more than 1,500 persons per active Private practitioner.

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3. That the physically disqualified new graduates will locate in the several States in proportion to the numbers of new physicians locating in each State during the 2-year period 1940-41.

4. That the numbers of interns, residents, and full-time salaried physicians remaining after recruitment on January 1, 1944, will continue to be distributed among the several States in the proportions which prevailed in 1942.

5. That no allowance can be made for physicians reentering civilian practice after discharge from the services since (a) their number and effectiveness cannot be predicted and (b) replacements for these losses may be required by the Army and Navy causing further recruitment from among civilian practitioners in 1944 and thereafter.

6. That changes in State population due to interstate migration after January 1, 1943, would be negligible, and that the population of each State would thereafter change in proportion to the increase or decrease for the country as a whole.

SUMMARY OF METHOD

(a) National figures: For 1942 the figure for total physicians was reduced by the sum of full-time appointments, interns, and residents to give private practitioners, and by the age specific retirement percentages to give active private practitioners. To obtain the 1944 figure the total number of physicians in 1942 was reduced by the total Army and Navy procurement objective (not including recruits from among new graduates) for the 2-year period, by deaths during the 2-year period (based on age-specific death rates), by interns, residents, and full-time appointments expected to remain after recruitment, and by the retirement correction applied to the new age distribution. Figures at the subsequent dates were derived by subtracting calculated deaths in each age group for each 2-year interval and recalculating the correction for retirements on the basis of the new age distribution.

(b) State figures: Computations were made for all States for 1942 and 1944, using the sources mentioned above for the data on distribution of the various categories of physicians by States, and the same method as used for the United States total. Estimates for the subsequent dates were made for only 17 States, selected by taking every third State in alphabetical order. These States were ranked by the 1942 ratio of persons per physician and 6 were selected which would demonstrate without undue crowding on figure 2 the trends shown for the 17.

Books Received

ELEMENTS OF MEDICAL MYCOLOGY. By Jacob Hyams Swartz, M.D., Assistant Professor of Dermatology, Harvard Medical School and Postgraduate School; Member American Dermatological Association, American Mycological Association; Dermatologist, Massachusetts General Hospital. Cloth. Pp. 190, with 80 illustrations. Price $4.50. Grune & Stratton, Inc., 381 Fourth Ave., New York City, 1943.

PATHOLOGICAL HISTOLOGY. By Robertson F. Ogilvie, M.D., F.R.C.P. (Edin.), Lecturer in Pathology and Assistant in Forensic Medicine, University of Edinburgh, Senior Pathologist, Royal Infirmary, Edinburgh, Pathologist to the Leith and Deaconess Hospitals, Edinburgh, Examiner in Pathology and Forensic Medicine for the Triple Qualification. Ed. 2. Cloth. Pp. 411, with photomicrographs in color. Price $9.00. The Williams and Wilkins Co., Baltimore, 1943.

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SURGICAL ERRORS AND SAFEGUARDS. By Max Thorek, M.D., LL.D., D.C.M., F.I.C.S., Prof. Surgery, Cook County Graduate School of Medicine; Attending Surgeon, Cook County Hospital; Surgeon-in-Chief, American Hospital, and a chapter on Legal Responsibility in Surgical Practice by Hubert Winston Smith, A.B., M.B.A., LL.B., M.D., Associate in Medical-Legal Research, Harvard Law School and Harvard Medical School, Boston. Ed. 4. Cloth. Pp. 1085, with illustrations. Price $15.00. J. B. Lippincott Co., Philadelphia, 1943.

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MEDICAL RADIOGRAPHIC TECHNIC. Prepared by The Technical Service Department of General Electric X-Ray Corporation under the editorial supervision of Glenn W. Files, Director. Cloth. Pp. 365, with illustrations. Price $6.00. Charles C. Thomas, 220 E. Monroe St., Springfield, Ill., 1943.

THE MICROSCOPE AND ITS USE. By Frank F. Munoz, Technical Microscope Consultant; in collaboration with Dr. Harry A. Charipper, Professor of Biology, New York University. Cloth. Pp. 334, with illustrations. Price $2.50. Clay-Adams Co., Inc., 44 E. 23rd St., New York City, 1943.

BACKACHE AND SCIATIC NEURITIS. By Philip Lewin, M.D., F.A.C.S., Associate Professor of Bone and Joint Surgery, Northwestern University Medical School; Attending Orthopedic Surgeon, Cook County Hospital; Attending Orthopedic Surgeon, Michael Reese Hospital; Professor of Orthopedic Surgery, Cook County Graduate School of Medicine, Chicago; Lieutenant Colonel, Medical Corps, U.S. Army. Cloth. Pp. 745, with figures and drawings. Price $10.00. Lea & Febiger, Washington Square, Philadelphia, 1943.

Book Notices

(Continued from page 260)

THE YEARBOOK OF PHILANTHROPY 1942-43. Presenting information and statistics covering American philanthropy since the year 1920, with charts and tables. Edited by John Price Jones. Cloth. Pp. 75. The Inter-River Press, New York City, 1943.

This is the third book in the series undertaking to give a year by year account of developments in the voluntary support of philanthropic institutions. The divisions are somewhat the same as in previous years though of course everything in the book reflects predominance of war appeals. It is shown not only that war-related causes dominate the field of giving in America, but also that their dominance is on the increase. Briefly there is discussed the unfavorable and the favorable factors arising out of this condition. A summary of yearly contributions going back a score of years provides a background for the study of foundations, trusts, bequests, corporations, and many other aspects of the great problem.

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*Berman, M. S., and Ivy, A. C.: The Toxicity of Various Iodine Solutions, Journal of Laboratory and Clinical Medicine 25: 113 (Nov.) 1939.

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ATLAS OF OBSTETRIC TECHNIC. By Paul Titus, M.D., Obstetrician and Gynecologist to the St. Margaret Memorial Hospital, Pittsburgh; Secretary, American Board of Obstetrics and Gynecology. Cloth. Pp. 180, illustrated with figures and drawings. Price $7.00. The C. V. Mosby Company, Pine Boulevard, St. Louis, 1943.

In the 180 large pages of this book there are 471 illustrations. It has no running text but undertakes simply to present in pictorial form with short titles the subject of modern obstetric technic and the various complications of pregnancy and the puerperium. There is also a section on the technic of sterility studies. The illustrations are from sketches made in the delivery and operating room and their titles are limited to a brief description of the details of technic shown in the drawings. The book supplements the author's "Management of Obstetric Difficulties"—in fact it may be said to supplement any standard text on obstetrics because it lacks their running descriptions and provides illustrations which to so large a degree they lack.

FRACTURES AND DISLOCATIONS FOR PRACTITIONERS. By Edwin O. Geckeler, M.D., Fellow of the American College of Surgeons, Fellow of the American Academy of Orthopaedic Surgeons, Diplomate of the American Board of Orthopaedic Surgery. Ed. 3. Cloth. Pp. 373, with 320 illustrations. Price $4.50. The Williams & Wilkins Company, Baltimore, 1943.

Well organized, well written, well illustrated, this book brings to the student and the general practitioner precise information concerning one of the most important branches in these days of the prevalence of trauma.

CLINICAL DIAGNOSIS BY LABORATORY EXAMINATIONS. By John A. Kolmer, M.S., M.D., Dr.P.H., Sc.D., LL.D., L.H.D., F.A.C.P., Professor of Medicine in the School of Medicine and the School of Dentistry of Temple University; Director of the Research Institute of Cutaneous Medicine; formerly Professor of Pathology and Bacteriology in the Graduate School of Medicine of the University of Pennsylvania. Cloth. Pp. 1239, with illustrations. D. Appleton-Century Company, Inc., New York, 1943.

Dr. Kolmer presents a well-balanced view of the place of so-called "clinical pathology." He says: " . . . laboratory examinations are not meant to be short cut or royal roads to diagnosis in the sense of supplanting careful histories and physical examinations. Indeed, they need not be resorted to at all except when they are the only means available for accurate diagnosis or for the purpose of eliciting additional clinical data upon which it may be based.

"Unfortunately, however, not a few physicians lean too heavily upon histories, physical examinations and 'hunches' for diagnostic purposes commonly referred to as the 'art' of medicine. . .

"No one can have a higher respect and reverence than I for the great physicians of the past who, perforce, relied alone on the art of medicine. But if they could walk our wards today they would be among the first to confess their sins of commission in diagnosis while voicing a prayer that all of our present and future knowledge in both the art and science of medicine will continue to reduce progressively the errors of diagnosis revealed in the postmortem room and due, not so much to errors of commission, as to those of omission so frequently ascribable to lack of knowledge, carelessness or indifference. . .

"Undoubtedly, the eagerness and willingness with which Osler checked the signs and symptoms of disease by pathological examinations after death contributed in large degree to his diagnostic ability and greatness as a physician. As is well known, many human beings recover from disease in spite of erroneous diagnoses and treatment providing the latter has not been too meddlesome or too hazardous. But not infrequently the chances of recovery are greatly increased by accurate diagnosis as the basis for proper and intelligent therapy. Only those clinicians who rarely, if ever, check their diagnoses by postmortem examinations are likely to go serenely along with supreme confidence in their diagnostic ability. Consequently they are also likely to be among those who neglect laboratory methods as diagnostic aids under the erroneous impression that the art of medicine is necessarily separate and distinct from its science."

From these paragraphs it may be assumed, and rightly, that this volume considers the subject not from the standpoint of the laboratory and its technics, but rather from that of the application of the interpretation of its results in the diagnosis of disease. It is a large and inclusive book of value to students whether in school or out.

(Continued on page 41)

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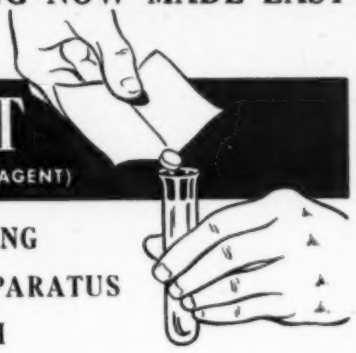

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Book Notices

(Continued from page 40)

TEXTBOOK OF PHYSIOLOGY. By William D. Zoethout, Ph.D., Professor of Physiology in the Chicago College of Dental Surgery (Loyola University), and W. W. Tuttle, Ph.D., Professor of Physiology, College of Medicine, State University of Iowa. Ed. 8. Cloth. Pp. 728, with 308 text illustrations and 3 color plates. Price $4.75. The C. V. Mosby Company, 3523-29 Pine Blvd., St. Louis 3, Missouri, 1943.

This is the eighth edition of a book which appeared first in 1916, intended to fill the gap between the larger texts—which are too voluminous for students in dental, pharmacy, and normal schools—and the often too elementary brief texts. It contains more than does the usual book, of what may be called "practical" information relating to nutrition, physical exercise, mental work, fatigue, and so forth.

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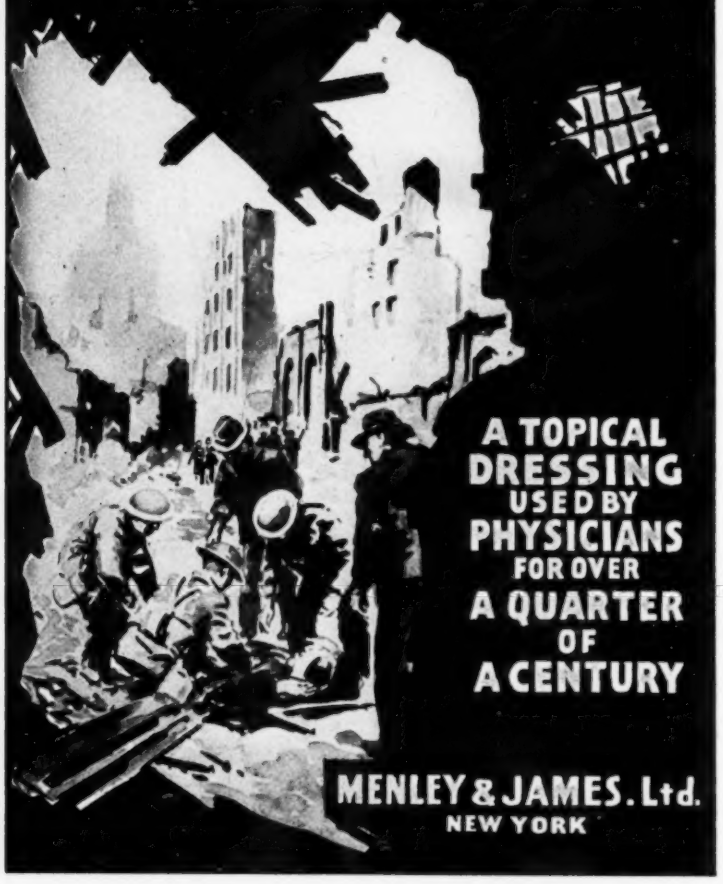

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AN ATLAS OF ANATOMY. By J. C. Boileau Grant, M.C., M.B., Ch.B., F.R.C.S. (Edin.), Professor of Anatomy in the University of Toronto. Vol. I. Cloth. Pp. 214, with 227 drawings, in 122 of which color has been used. Price $5.00. The Williams and Wilkins Company, Mt. Royal and Guilford Ave., Baltimore, 1943.

In this volume of 214 large pages there are covered the upper limb, abdomen, perineum and pelvis, and lower limb. This is to be followed shortly by volume two covering principally the thorax, head and neck, vertebral column and back. As the title indicates the volume is predominantly one of pictures. Not only are the majority of them in color but 79 are in three or four colors. Labeling is clear and plain. Each picture is accompanied by text matter which emphasizes points of significance. In every case the specimen was posed and photographed; from the negative an enlarged positive film was made; the outlines of the enlarged film were traced on tracing paper, which was compared with the original, and a plastic drawing made in which the important features were brought out. It is strictly in keeping with modern methods of teaching anatomy by dissection, and a valuable addition to available helps.

PERSONAL AND COMMUNITY HEALTH. By C. E. Turner, A.M., Sc.D., Dr.P.H., Professor of Public Health in the Massachusetts Institute of Technology; Formerly Associate Professor of Hygiene in the Tufts College Medical and Dental Schools; Sometime Member of the Administrative Board in the School of Public Health of Harvard University and the Massachusetts Institute of Technology. Ed. 7. Cloth. Pp. 585, with illustrations. Price $3.50. The C. V. Mosby Company, St. Louis, 1943.

Beginning with 1925 this book has gone through six previous editions and continues to be useful to general college students as well as being helpful to the medical student as an introduction to courses in public health and preventive medicine. It is good also for the physician in general practice to read from time to time.

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A MANUAL OF PULMONARY TUBERCULOSIS (PART I) and AN ATLAS OF THORACIC ROENTGENOLOGY (PART II). By David O. N. Lindberg, M.D., F.A.C.P., Lecturer on Tuberculosis, State University of Iowa, College of Medicine; Director of Roentgenology, State Sanitorium, Iowa. Cloth. Pp. 233, with 189 illustrations. Price $6.50. Charles C. Thomas, Publisher, 220 East Monroe Street, Springfield, Illinois, 1943.

This fairly small book does not pretend to cover the field of tuberculosis, including such aspects as allergy, immunity, resistance and morphology, nor to go into theoretical experimental or controversial matters, but does aim at the practical phases of the subject, going into the new evaluation of physical signs, fluoroscopy, roentgen-photography, conventional and body section radiography.

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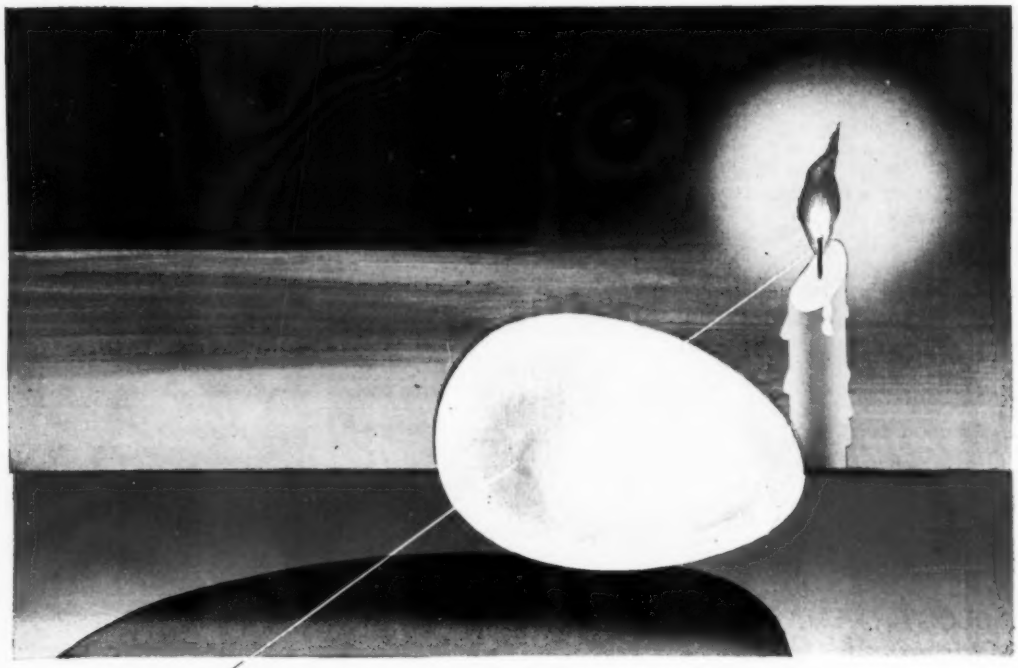

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